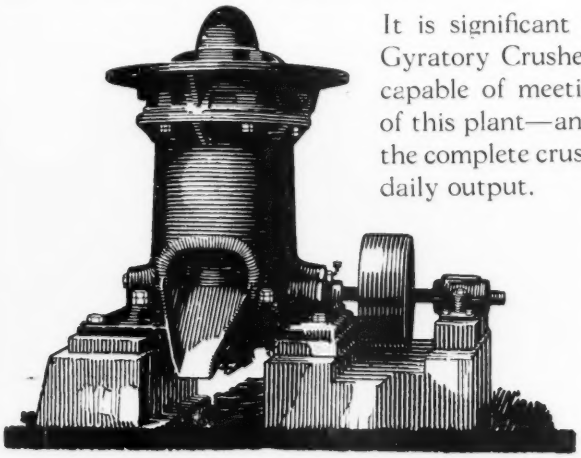
Pit and Quarry
SAND ▪ GRAVEL ▪ STONE
HANDLING ▪ CRUSHING ▪ SCREENING ▪ WASHING

The only crusher needed in this 100 car plant

The Ball Benton gravel plant at Benton, Arkansas was built only after a thorough investigation of many plants. The resulting efficiency has proven the wisdom of this course.



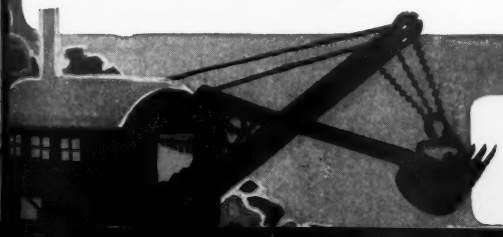
It is significant that an Austin No. 5 Gyratory Crusher was chosen as most capable of meeting the crushing needs of this plant—and this one crusher does the complete crushing job for the 100 car daily output.

Great capacity with efficiency is but one of the noteworthy features of Austin crushers. Others are explained in the Austin Crusher Bulletin.

Write for your copy.

AUSTIN MANUFACTURING CO.

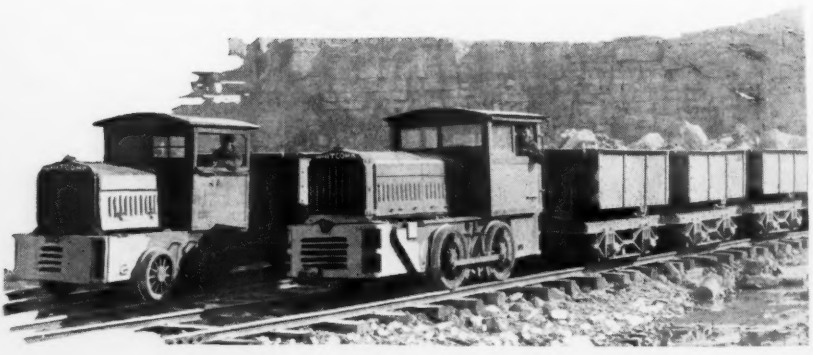
400 N. Michigan Ave. CHICAGO



June 15, 1925

Index to Advertisers - - - - - - - Page 33
Table of Contents - - - - - - Page 31

Circulation 7,600



You Should Use A "Whitcomb"

In sand and gravel plants, quarries, cement plants, lime plants, in fact any place where haulage tools are used, where the service is severe, the hauls long, the grades steep, the track uneven or temporary, *there you will find a "Whitcomb."*

The first successful gasoline locomotive was built in 1906. It was a Whitcomb.

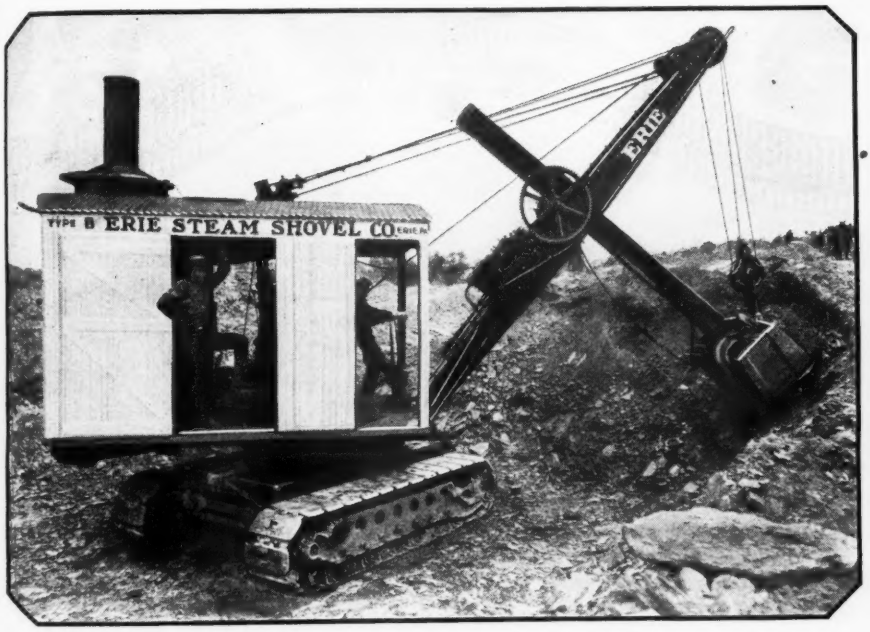
Many of the locomotives we are building today are for people who had one or more "Whitcombs" on the job, and who have been so satisfied with their performance that they will consider no other locomotive at any price.

A letter to any of our offices will bring you complete information on "Whitcombs"—"Designed to work—built to over work."

GEO. D. WHITCOMB COMPANY
Rochelle - - Illinois

Offices in principal cities

GASOLINE-STORAGE BATTERY-ELECTRIC
WHITCOMB LOCOMOTIVES



Buying More and More Steam ERIES!

Do you know that ERIE Shovel sales for April and May, 1925, ran *more than 15 per cent ahead of the biggest April and May Sales in any previous year?*

There are now more than 3450 ERIES in service—and you know why! The quarryman who has "been through the mill" wants the shovel that *gets the work done*—and he knows from past experience which shovel that is.

ERIE reliability is what counts.

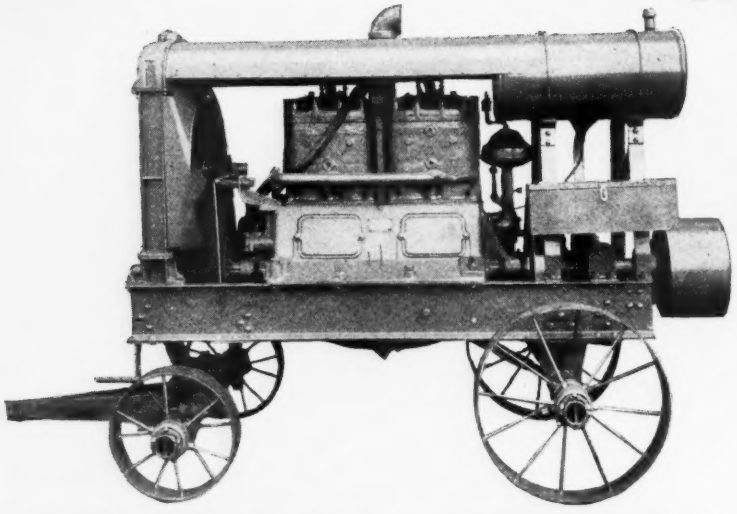
Once you have used an ERIE, and know how much better it really is *from actual comparisons*—The ERIE is what you will want to buy. "Repeat orders" (from old ERIE owners) have been larger to date in 1925 than during the same period of any previous year.

And—in spite of the record breaking sales of ERIES — by working night and day shifts, we are still able to make prompt deliveries.

ERIE STEAM SHOVEL CO., Erie, Pa., U. S. A.

ERIE Revolving Shovels

Builders of ERIE Shovels, Cranes, etc.
Branch Offices: Boston, New York, Philadelphia, Pittsburgh, Atlanta, Chicago. Representatives throughout the U. S. A.



TWIN CITY
Portable Power Unit

SPECIALLY designed for work that requires the power to be brought to the job. A sturdy, compact, easily transported outfit — built complete in our own shops. Equipped with the ever dependable, powerful and long-lived Twin City Engine. Manufactured in sizes 35 to 140 horsepower.

Twin City Engines can also be bought separately for Heavy Duty Stationary, Portable and Traction Outfits. Specify Twin City Engines on your equipment.

Write for literature and specifications.

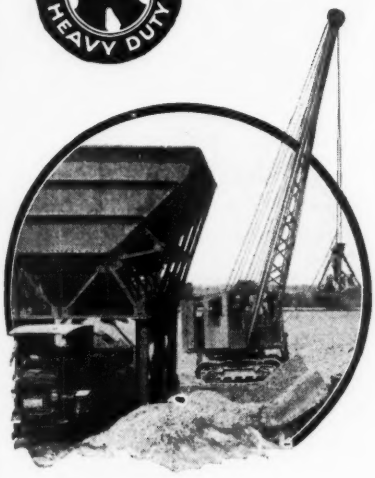
TWIN CITY COMPANY
MINNEAPOLIS, MINN.

Heavy Duty Engine Manufacturers Since 1903

"BUILT TO DO THE WORK"

KOEHRING

Crane



HOISTING, peaking, sluing, propelling; accuracy, ease and speed depend on the clutches.

The Koehring double outside band friction clutches give a new smoothness and accuracy to every operation as well as *Finger-tip control* at the operating levers.

66% greater clutch friction area gives remarkable ease and flexibility in operation — without losing the "feel" of the load—contributes to faster operation as well as to low maintenance and the elimination of clutch troubles.

Koehring clutch bands tighten from opposite sides of the drum, operating through an equalizing device which does away with all binding or side thrust on drum or bearing!

Go over the Koehring from multiplane to boom peak—you'll find Koehring improvement in design, Koehring Heavy Duty construction giving new factors to speed of operation, dependability, low maintenance and long service life.

Write for Crane Bulletin No. Cr. 32

Crane Capacities

No. 1 — 10 tons at 12 ft. radius. Clamshell buckets loaded with sand or gravel: 1 cu. yd. bucket weighing 3450 lbs. at 28 ft. radius, ¾ cu. yd. bucket weighing 2600 lbs. at 34 ft. radius. Boom lengths to suit conditions. 4 cylinder, 5 in. x 6 in. gasoline engine, 1000 R.P.M.

No. 2 — 15 tons at 12 ft. radius. Clamshell buckets loaded with sand or gravel: 1¼ cu. yd. bucket weighing 3850 lbs. at 32 ft. radius, 1 cu. yd. bucket weighing 3450 lbs. at 36 ft. radius, ¾ cu. yd. bucket weighing 2600 lbs. at 43 ft. radius. Boom lengths to suit conditions. 4 cylinder, 5¾ in. x 7 in. gasoline engine, 1000 R.P.M.

KOEHRING COMPANY MILWAUKEE WISCONSIN

PAVERS, MIXERS—GASOLINE CRANES, DRAGLINES AND SHOVELS

Sales Offices and Service Warehouses in all principal cities

Foreign Dept., Room 1370, 50 Church St., New York City.
Canada, Koehring Company of Canada, Limited, 105 Front St., East, Toronto, Ontario
Mexico, F. S. Lapum, Cinco De Mayo 21, Mexico, D. F.

A 2785-III-IV

Marion Bulletin No. 310 picturing and describing in detail Electric Shovels Model 32 and 37 is now ready for distribution

Write for your copy

Marion builds a complete line of excavating machinery ranging from ¾ cu. yd. to 10 cu. yd. dipper capacity. Write and let us send you bulletins and data concerning the shovel with the dipper capacity in which you are interested.

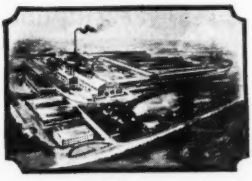
The Marion Steam Shovel Co. Marion, Ohio, U. S. A.

Established 1884

2901

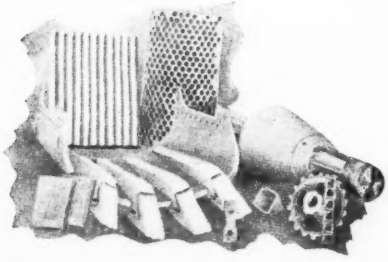
MARION

High Bridge, N. J.
Manganese Steel
Wearing Parts



Easton, Pa.
Special Trackwork
Cylinders for Gases
Hollow Rollers

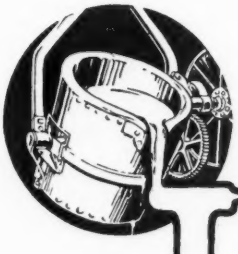
Philadelphia, Pa.
Rolls and Rolling
Mill Machinery
Forgings



TISCO Wearing Parts

TISCO Manganese Steel castings are used in wearing parts of all makes of jaw and gyratory crushers, pulverizers, hammer mills, screens, steam shovels, dredges, suction pumps, elevators and conveyors and similar machinery subjected to severe service.

For castings subjected to shock its wear-hardness is remarkable. It should be used where time is such an important factor that the cost of a shutdown for replacement means more than the first cost of repair parts.



Taylor-Wharton Iron & Steel Co.
High Bridge, New Jersey

Sole owner of the Hibbard-Howe Patents covering basic processes for the electric manufacture of manganese steel

TISCO

Plant Operating Economies

ECONOMICAL plant operation requires equipment offering the least liability to shut-downs with their attendant product losses. Westinghouse electrical equipment is the best assurance against such losses.

In quarries, gravel pits, cement mills, sand plants, dredges, and in many other rock product activities, Westinghouse motors are demonstrating their ability to operate satisfactorily day after day, year in and year out. They have that freedom from interruption and from the necessity for repairs that greatly lowers the cost per ton of the product. Reliability, and not first cost, is the true basis of evaluation.

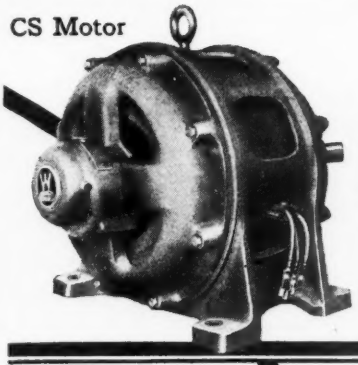
Westinghouse motors and control are a dividend-paying investment. Divide the cost by the years they last.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of
the United States and Foreign Countries

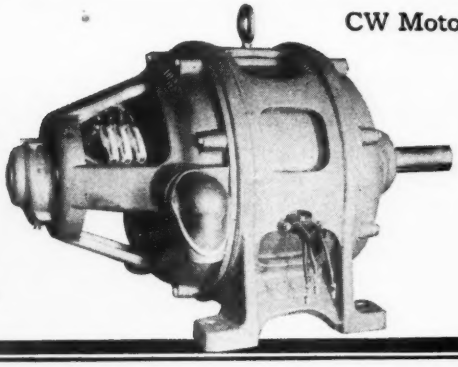
Westinghouse

X 81749

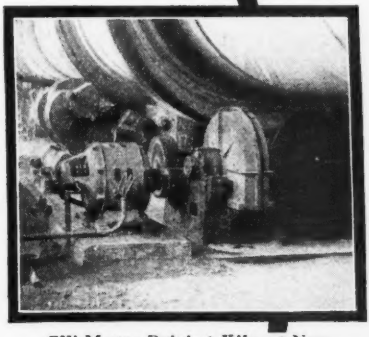
CS Motor



CW Motor

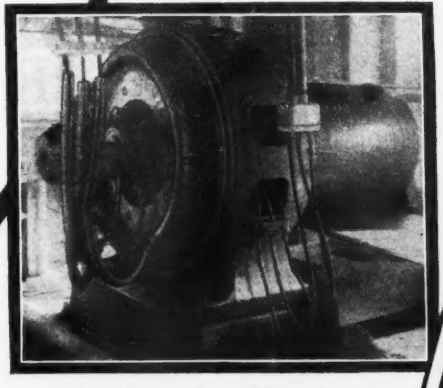


Divide the cost by the years they last.



CW Motor Driving Kiln at New Egyptian Portland Cement Co.

Electric Drag Line Excavator operated by Westinghouse Motors



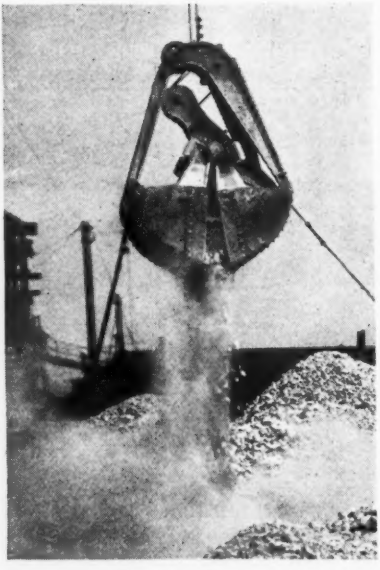
400 hp. Westinghouse Motor Driving a 15 in. Centrifugal Pump on Sand Dredge

Motors & Control

X 81750

MEAD-MORRISON

TYPE "W" GRAB



FAST DISCHARGE

NOTICE how the Type "W" Grab drops its load when the shells are barely open. Their deep-curved design gives almost instantaneous discharge with no time lost between trips. All kinds of materials, from fine sand to big rocks are handled easily and economically. Type "W" digs down as it closes, the powerful jaws filling the Bucket for a capacity load every trip. The terrific "bite" combined with the light weight of the Grab, variable rope reeving and attachable weights makes the Bucket **Universal in use** —as efficient on heavy excavating as on fast rehandling. It gives more pounds per load, more loads per day and dependable year-round service

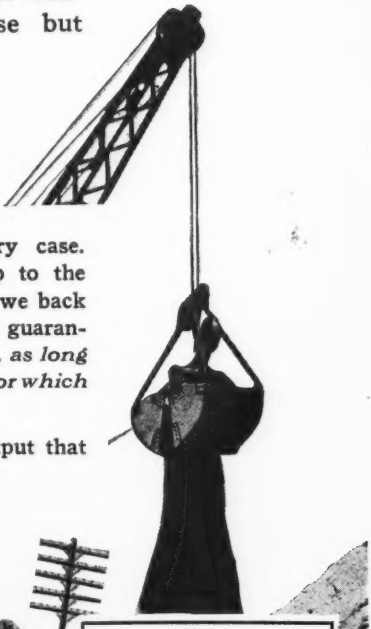
MEAD-MORRISON
MANUFACTURING COMPANY

628 Prescott Street **East Boston, Mass.**

"Just one make of bucket has been able to last on our work— the WILLIAMS!"

After a three-year test of five different buckets, the Diamond Sand & Gravel Co., of Bedford, Ohio, now use nothing else but WILLIAMS Buckets because—

"We have found WILLIAMS to be the only bucket that will do our work and stand up— none of the other buckets were able to last nearly as well."— A. W. Schmidt, Supt.



And that's the story in practically every case. Each WILLIAMS Bucket is built to live up to the reputation of the whole WILLIAMS line. So we back up every WILLIAMS Bucket with this unique guarantee: *All parts guaranteed against breakage, as long as the bucket is used on the classes of work for which we recommend it.*

We are always glad to prove the extra output that you can get with a WILLIAMS.

Actual performance is the most convincing evidence —*"Let the bucket do the talking."* Let us put you in touch with gravel producers who have made careful tests of buckets; write us.

G. H. WILLIAMS COMPANY, 605 Haybarger Lane, Erie, Pa.

Eastern Sales Office: 30 Church Street, New York City

WILLIAMS
FAST-DIGGING BUCKETS
All Parts Guaranteed Against Breakage

Cuts Like a
Tiger's Tooth

The powerful crowding motion of the P & H Gasoline Shovel forces the manganese teeth of the dipper to bite into the heaviest and most stubborn soil with a cut as swift and sure as that of a saber-toothed tiger. Regardless of the dipper position the action is quick and positive and under immediate control of the operator.

Compact construction, easy and fast operation, low cost service, and long life are P & H factors that mean bigger profits for the contractor who owns one. Let us send you Bulletin 81-X which shows P & H Shovels both in construction details and in action in the field.

P & H Power Clutch Control Increases Output

The operator of a P & H simply moves the levers with a slight pull and engine power does the rest—less fatigue, greater speed of handling, and larger output.

HARNISCHFEGER CORPORATION

Successor to

PAWLING & HARNISCHFEGER CO.

Established in 1884

3851 National Avenue Milwaukee, Wis.

Offices and Agents in Principal Cities

Warehouses and Service Stations: New York, Memphis, Jacksonville, San Francisco, Los Angeles, Seattle

P&H GASOLINE SHOVEL

Always Rarin' To Go!

Like a thoroughbred horse impatient for action, a Modern Massillon Steam Shovel digs into its work with vim.

Superabundant power, strength, steady speed and mobility that cope with any condition are characteristics of the Modern Massillon. In addition, there are other good qualities that the operator will appreciate—accessibility, low maintenance, interchangeable repair parts, and ease of operation.

You more fully appreciate this combination of qualities when you read how this shovel is constructed. Write for descriptive literature.

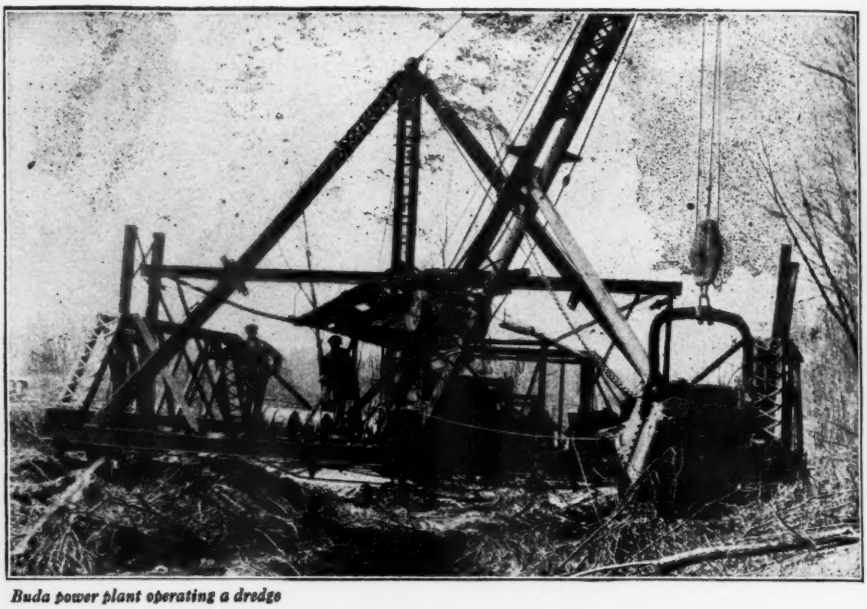
THE RUSSELL & CO.

MASSILLON, O.

(Established 1842)

The **MODERN MASSILLON**

Steam — 3/4 – 7/8 RANGE — **Shovel**



Buda power plant operating a dredge

Making a Hard Job Easy

FOR every gasoline power requirement there is a Buda power plant; for dredge, shovel, hoist, pump, drag line, excavator and air compressor. Wherever used, the combined initial and operating cost of this unit has been extremely low.

The latest development in Buda Power Units is the 85 H.P. Model JV—5¾″ x 7⅛″. It is designed especially for the hard job—¾- to 1-yard shovels, hoists, drag lines, excavators, 10-ton cranes, extra large air compressors and similar equipment. Write for complete details. Our engineers will gladly work with you on any of your power problems from 20- to 85-horse power.

THE BUDA COMPANY, HARVEY CHICAGO SUBURB ILL.
ESTABLISHED 1881

Standardize on Buda Power for your Industrial Equipment

BUDA
The
ENGINE

Koppel Cars Are Used the World Over

Kelley Island Lime & Transport Company solved their transportation problem with Koppel Cars, as shown here. All lines of industry all over the world have done the same thing. The Koppel Organization has had over 40 years' experience in building and developing industrial and narrow gauge railroads of every description.

Consult our Engineers at the nearest address to you—Koppel, Pittsburgh, New York, Chicago or San Francisco—about your material handling and transportation problems. No obligation incurred. Bulletins on request.

Rails — Switches — Frogs — Track

KOPPEL INDUSTRIAL CAR & EQUIPMENT CO.
KOPPEL, PENNA.

Sales Offices:
Pittsburgh New York Chicago San Francisco

KOPPEL *cars and tracks for* ***QUARRIES***

AN INTERESTING BOOK FOR YOU

For All Power Users

Just off the press; progressive business men in every field where "gas power" is used will find this book to be a reliable directory and exposition of the applications of the most complete line of Portable Industrial Power Units available. All of them have Waukesha "Ricardo Head" Motors.

If this advertisement suggests that a Waukesha "Ricardo Head" Motor will solve a power problem for you, ***write for this book.***

WAUKESHA MOTOR COMPANY

Waukesha, Wisconsin

Eastern Sales Office *Aeolian Building, 33 W. 42nd Street* *New York City*

Exclusive Builders of Heavy Duty Gasoline Engines for Nearly Twenty Years

THE INSLEY EXCAVATOR

Not to do the work of a large shovel — But to do the work a large shovel can't do — PROFITABLY

Three or Four Hundred Yards Per Day is a Whale of a Lot of Dirt

SUCH a yardage however is easy going for the Insley Excavator and it is logical for users of excavating equipment to ask themselves—why place a heavy investment in heavy equipment when the Insley will do the work?

THE INSLEY EXCAVATOR is a light machine, as excavating equipment goes, of comparatively low first cost.

Its design and construction are such that operating and maintenance costs are reduced to a minimum.

Full Crawler Traction — Buda Power Plant
Cut Gears — Low Center of Gravity — Roller Bearings

It is a machine that you should investigate before equipping yourself for basement, road, quarry, ditching or general excavation work. Write for Bulletin No. 47.

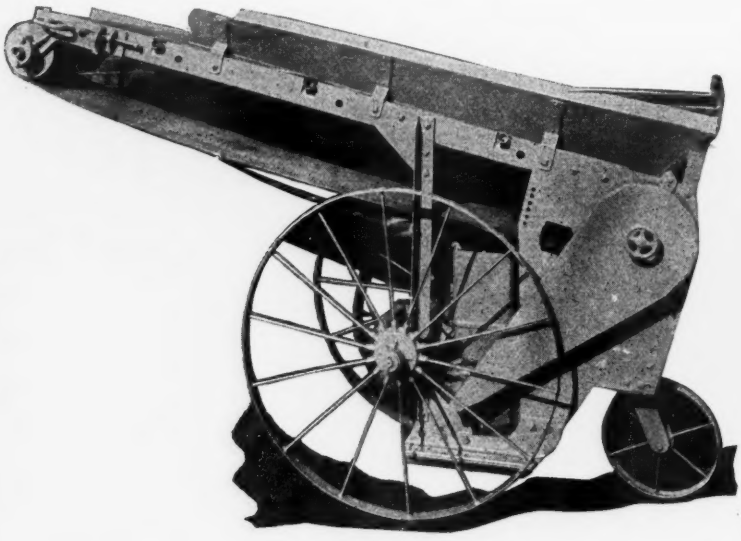
Concrete Placing Equipment
Steel Derricks

No. 449

Buckets and Cars
Excavating Equipment

INSLEY MANUFACTURING CO.

Engineers and Manufacturers *INDIANAPOLIS*



Economize On Your Loading It's An Important Operation

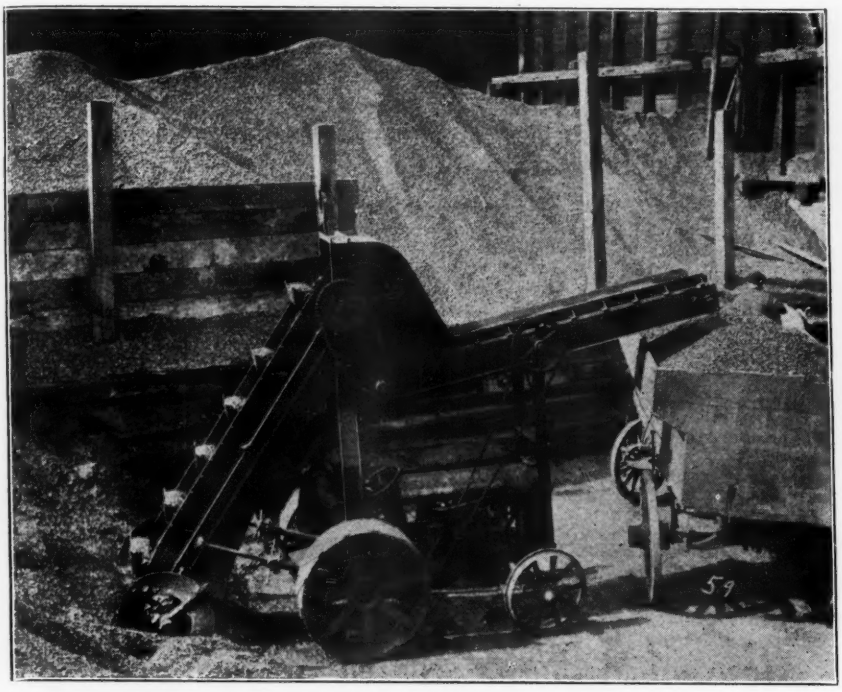
Competition and progress are constantly demanding and bringing about greater perfection in every detail of industrial operation. Loading and unloading of materials is an important operation where big savings can be effected. The improvement over old methods in an Ottumwa Box Car Loader is very decided. It means a saving in dollars and cents.

It eliminates the loading gang, loads with tireless regularity, prevents delays and increases capacity. It reduces costs and pays substantial dividends in economy.

It is adjustable and easily handled by one man, and is operated by electric or gasoline power. It has roller and ball bearings throughout, and latest improved Alemite Greasing System.

Write today for information and prices.

OTTUMWA BOX CAR LOADER CO.
OTTUMWA, IOWA



The saving would soon pay for a Specialty

A Specialty Fordson Loader has all of the qualities that make minimum loading cost possible—speed, durability, self-feeding, crowding and digging.

It is built scientifically correct—the result of our ten years' experience in the manufacture of portable wagon loaders. With a Fordson Tractor as a source of power, it means simplicity of operation, dependability, ease of installation and Ford Service.

One man, the operator, only is needed. He has full, easy control of the machine. He can crowd when buckets are in operation, independent of reverse gear. He may crowd the loader two inches or any distance—and he does the whole job of loading with ease, speed and economy.

You should know more about the big economy and advantages this efficient loader offers. Write for bulletins or see any Ford dealer.

SPECIALTY ENGINEERING CO.

Allegheny & Trenton Ave. Philadelphia, Pa.

Industry's Toll to Breakdowns

How much do you contribute each season?

ELIMINATION of breakdowns in the non-metallic mineral industries will probably never become a reality, but a substantial reduction in the present tremendous loss in time and money can be accomplished by the use of Era Manganese Steel Castings.

Where abrasive wear is an important factor in the life of any equipment, parts made of Era Manganese Steel will add months of service to that equipment. It will cut the toll that is depriving you of rightful profits.

Upon a basis of economy alone, Era Manganese Steel wearing parts for equipment justify their use. Then there is the satisfaction of knowing that you can depend upon Era Manganese Steel giving long, dependable service under any conditions that you may impose—and that's worth something.

A standard quality at a standard price.

HADFIELD-PENFIELD STEEL CO.

Bucyrus, Ohio

MANGANESE STEEL

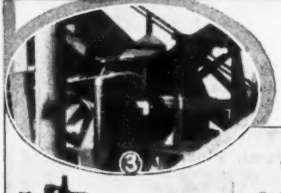
ERA

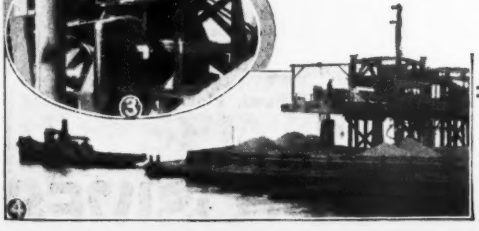
THE FIRST - STILL LEADS IN QUALITY

TELSMITH CRUSHERS *at* CATALINA QUARRY

Quarry men from all over the west are visiting the crushing plant of the Catalina Company, located on Catalina Island near Los Angeles. Built on a steep mountain-side, overlooking the Pacific Ocean, this is not only one of the most modern plants in the United States; but is likewise the most picturesque. The initial breaker is a 48x60-in. jaw crusher, which breaks up the large rock to 8"-10" size. The hill-side has been excavated to provide storage under the jaw crusher; and conveyors have been installed in a tunnel to take the rock to a No. 16-A Telsmith Primary Breaker, set to 2½-in. discharge. This machine has demonstrated its ability to handle 110 tons per hour, with an average power consumption of 50 HP. The minus 2-in. rock is then scalped out and the rest is re-crushed by two No. 4 Telsmith Reduction Crushers, set to make minus 1½-in. size.

It is questionable just how long a cast iron crusher would survive in this plant. The rock is a very hard basalt. The machines are all worked to full capacity, with no mercy shown. Frequently, bits of tramp iron slip through into the feed. This is no place for a weakling crusher. But Telsmith is built to endure severe usage. With steel frame, steel crown, unbreakable bolt-shaft, short structure, huge bearings, automatic lubrication, it was only to be expected that Telsmith would succeed, even at the Catalina quarry—and Telsmith has made good *as usual.* Glad to send you, without obligation, Catalog No. 161 (Telsmith Primary Breaker) and Bulletin No. 2F15 (Telsmith Reduction Crusher).





SMITH ENGINEERING WORKS
3183 Locust Street, MILWAUKEE, WIS.

Canadian Representatives:
Canadian Ingersoll-Rand Co., Montreal, P. Q.

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Waldo Bros. & Bond Co., Boston, Mass.
816 Otis Bldg., Philadelphia, Pa.
Beckwith Mchy. Co., Cleveland—Pittsburgh
Seibert-Millburn Co. Columbus, O.
Brandeis Mchy. & S. Co. Louisville, Ky.
Borchert-Ingersoll, Inc., St. Paul, Minn.
Geo. F. Smith Co., St. Louis, Mo.
Bunting Hdw. & Mchy. Co., Kansas City, Mo.
Burnite Mchy. Co., Denver, Colo.
Salt Lake Hdw. Co., Salt Lake City, Utah.
Stuart S. Smith Co., San Francisco, Calif.
Garlinghouse Bros., Los Angeles, Calif.
Road Builders Eq. Co. Portland, Ore.

For Hand or Shovel Work—Grasselli Explosives

WHETHER for hand-loading or shovel work, there's a grade of Grasselli Explosives that will bring down your stone in just the size and condition you want.

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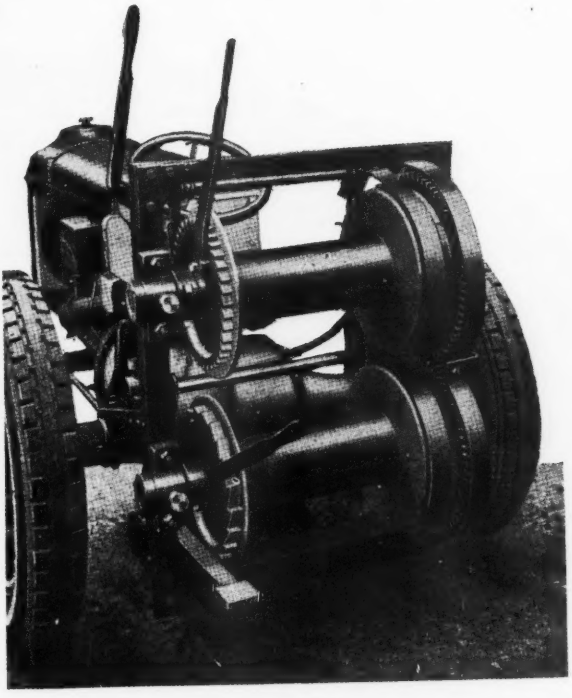

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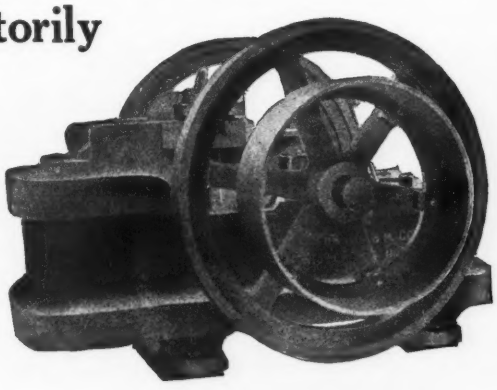

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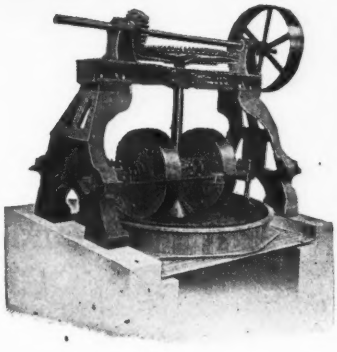

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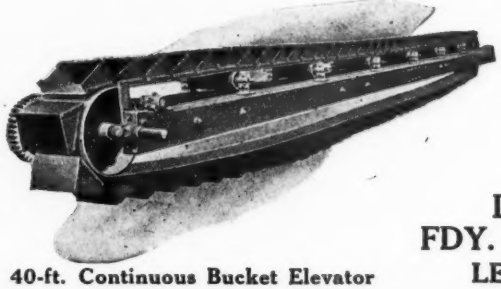

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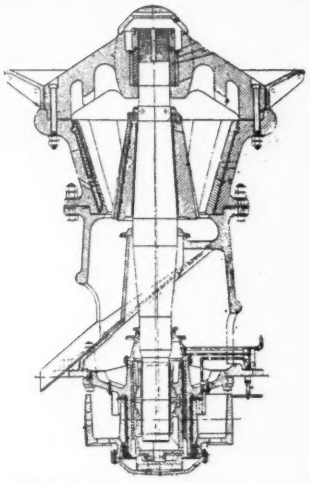

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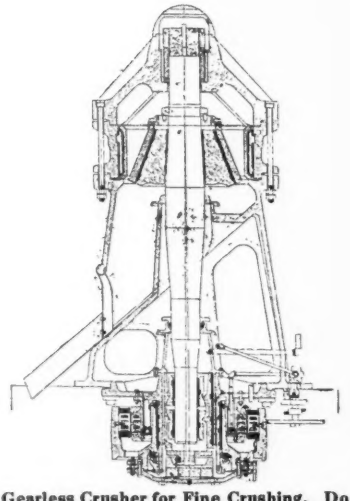

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Index to Advertisers

VOL. 10 CHICAGO, ILL., JUNE 15, 1925 NO. 6

American Steel & Wire Co..... 109
Atlas Car & Mfg. Co..... 98
Austin Mfg. Co.....Front Cover

Bacon, inc., Earl C..... 101
Baker Car Unloader Co..... 103
Bay City Dredge Wks..... 99
Blaw-Knox Co. 100
Bradley Pulverizer Co..... 104
Briggs and Turivas.....93-96
Brookville Truck & Tractor Co..... 107
Brown Hoisting Machy. Co..... 62
Buckeye Dryer Co..... 118
Buckeye Machine Co..... 101
Buda Co. 14
Burch Plow Works Co..... 116
Burnham, Royal E..... 104
Burrell Eng. and Const. Co..... 98
Byers Machine Co..... 34

Caldwell and Son Co., H. W..... 118
Chicago Perforating Co..... 98
Conveying Weigher Co..... 108
Curtis Pneumatic Machy. Co..... 114

Dixie Machy. Mfg. Co..... 100
Domestic Engine & Pump Co..... 105

Eagle Iron Works..... 105
Easton Car and Const. Co..... 107
Economy Pumping Machy. Co..... 98
Egyptian Iron Works..... 106
Ensign-Bickford Co..... 108
Equipment Corporation of America.. 90
Erie Steam Shovel Co..... 3

Fate-Root-Heath Co. 60-61
Foster Co., L. B..... 96

Gay Co., Rubert M..... 99
Gebret Bros., Inc..... 106
Georgia Iron Works..... 115
Grasselli Powder Co..... 22
Green, L. P..... 100

Hadfield-Penfield Steel Co..... 20
Haiss Mfg. Co., Geo..... 111
Harnischfeger Corporation 12
Heineken, W. P..... 93
Howe Chain Co..... 117
Hoffman Bros..... 98
Hyman-Michaels Co. 91-95

Industrial Equipment Co..... 106
Insley Mfg. Co..... 17
Interstate Equipment Corp..... 113

Kansas City Hay Press Co..... 103
Kennedy-Van Saun Mfg. and Engr. Corp. 20
Kilby Frog and Switch Co..... 100
Koehring Co. 5
Koppel Industrial Car & Equip. Co... 15

Letson Co., T. H..... 95
Lewistown Foundry and Mach. Co..... 27
Lidgerwood Mfg. Co..... 116
Loomis Machine Co..... 105
Ludlow-Saylor Wire Co..... 112

McGann Mfg. Co..... 103
McLanahan-Stone Machine Co..... 112
McNeal Machinery Co. 93
Magnetic Mfg. Co..... 102
Manganese Steel Forge Co..... 113
Marion Steam Shovel Co..... 6
Mead-Morrison Mfg. Co..... 10
Milwaukee Locomotive Mfg. Co..... 103
Morris Machine Works..... 87
Mullins Body Corp..... 110
Mundy Hoisting Engine Co.....Back Cover

New Holland Machine Co..... 102

O. K. Clutch & Mchy. Co..... 116
Osgood Co. 102
Ottumwa Box Car Loader Co..... 18
Owen Bucket Co. 98

Pawling and Harnischfeger..... 12
Paxson Co., J. W..... 102
Pennsylvania Pump and Compressor Co. 99
Pettibone Mulliken Co..... 115
Punxsutawney Drilling and Contr. Co... 98

Rennolds Equipment Co..... 95
Russell & Co. 13

St. Mary's Oil Engine Co..... 98
Sanderson Cyclone Drill Co..... 111
Sauerman Bros. 24
Smith Engineering Wks..... 21
Sonken-Galamba Corp. 93
Sonntag, C. H..... 104
Southern Iron & Equip. Co..... 90
Specialty Engineering Co..... 19
Spinks Supply Co..... 23
Symons Bros. Co..... 104

Taylor-Wharton Iron & Steel Co..... 7
Thew Shovel Co..... 30
Thomas Elevator Co..... 101
Tips Engine Works..... 101
Twin City Co..... 4

United States Rubber Co..... 119
Universal Vibrating Screen Co..... 99
Used Equipment Bargains.....90-96

Venn-Severin Machine Co..... 114
Vulcan Iron Works..... 32

Waukesha Motor Co..... 16
Western Wheeled Scraper Co..... 89
Westinghouse Electric and Mfg. Co... 8-9
Whitcomb Co., Geo. D..... 2
Williams Co., G. H..... 11
Wood Drill Works..... 104
Woodhouse Chain Works.....109

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VOL. 10 CHICAGO, ILL., JUNE 15, 1925 No. 6

FEATURE CONTENTS

A Phase of the Production Problem 35
An editorial concerning the scheduling and controlling of production for a future market.

Utilizing Advantages in Operating Crushed Stone Plant 37
An illustrated description of the Syracuse Plant of the Rock Cut Stone Company. This Plant is a hillside operation producing 3500 tons daily.

Heavy Digging Revolving Quarry Shovels....43
An illustrated article by an engineer discussing the new heavy digging revolving quarry shovels.

Operating a Sand and Gravel Plant Under Exceptional Conditions 47
An illustrated discussion by an engineer of the operations of the Stamford Local Materials Company.

Mining and Milling Feldspar.....53
An illustrated article dealing with the mining and milling of feldspar as practiced by the Erwin Feldspar Company which operates twenty mines.

Operating a Sand and Gravel Plant on a Large Scale 63
An illustrated description of the operations of the Ball Benton Gravel Company at Benton, Arkansas, where 100 cars are produced daily.

The Railroad and the Motor Truck.....67
A discussion by a well known traffic counselor concerning the development of short haul traffic by the motor truck.

Blasting in Quarry and Open Pit Mining.....71
The second of a series of six articles on this subject by an engineer concerned with the management and operations of two crushed stone quarries as well as a consulting practice.

Kiln Performance 79
The second of a series of articles dealing with the factors governing modern lime kiln capacity and fuel economy by a combustion engineer.

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Pit and Quarry

Vol. 10 Chicago, Ill. June 15, 1925 No. 6

A Phase of the Production Problem

BUSINESS success is largely dependent upon the management's ability to predict. All plans are made for the future and are successful only if the future brings the results that have been anticipated. Markets must be estimated, prices determined upon, labor secured, capital supplied, equipment bought, all upon the prediction that certain conditions will exist at a later time. The inability of executives to predict accurately is one cause for the large number of failures, nearly ninety per cent, in industry today. The executive whose prediction is mere guess work and is not reached scientifically is almost certain to meet disaster sooner or later. There are sound, basic principles which should govern the plans for the scheduling of production.

We know that the scientist can predict with accuracy because he bases his calculations on the accumulated knowledge in the branch of science in which he works. Science knows that identical causes produce identical effects. The chemist knows exactly what the result will be when two analyzed substances are combined. The physicist does not have to guess how much a column of water of a certain height will weigh. In any field where the facts and laws are known, the predictions of the scientist are easily made. Inaccurate prediction is due to ignorance of the facts or laws that govern the results. Hence the executive whose prediction proves disastrous has not studied the facts and forces that affect the industry which he is directing.

The chance of failure in prediction in the small plant is not great. The owner knows what can be expected in regard to labor supply and wages; he controls his finances himself; he is familiar with price fluctuation and has a stable market close to his plant. He carries the information in his own head and handles his problems personally. As the industry grows and expands, however, the importance of safe prediction becomes more vital. No executive would attempt to manage a large, modern plant with methods suitable perhaps in a small business. He would not attempt to analyze and classify all the facts necessary for determining policies for the future. If for no other reason than that he would jeopardize the status of the business in case he were incapacitated, he will delegate duties and responsibilities to minor executives. The facts that he will need in order to plan for future production he will secure through the work of many subordinates.

There are two parts to planning production; scheduling and control. In scheduling, the vital thing is an analysis of facts. First to be ascertained is the amount of the product that can be marketed. Some plants can produce to the limit of their capacity with assurance of a profitable market; others are over-taxed during a rush season and are forced to resort to temporary and expensive methods in order to take care of their customers. There are many sources of information concerning market conditions which are available. Government statistics, technical data, reports of experts in the industry are all of inestimable value in planning for future production. The sales department will analyze all of these reports which deal with the market with which the organization is concerned and assemble them for the consideration of the management in preparing a schedule of production. A well organized sales department is of great value. The record of previous sales, the amount spent in advertising, and other sales costs are important factors in working out a sales policy for the coming year.

An important factor in all business calculations is the business cycle. Periods of so called good and bad times occur with a regularity that has led to a careful study during recent years. It is now possible to

determine with some accuracy what may be expected in certain phases of industry. Failure to note the stage of the cycle in which business is at any one time is often a cause of bankruptcy.

A good cost accounting system is necessary in scheduling production. If the estimated cost of production of each element in the productive process is known, the management can determine accurately which lines are profitable and which ones result in loss. A cost system will also indicate where waste exists and can be eliminated; where economy in routing, in use of equipment, and in handling of materials may be secured.

In scheduling production it is necessary to measure plant capacity in order to determine the productive possibilities of the plant equipment. How much idle machine time is there in the plant? Can it be reduced? Is the flow of materials clogged at any point? Is the layout of the plant a result of careful planning or a haphazard matter? Does it illustrate the axiom that a straight line is the shortest distance between two points?

A production schedule is satisfactory only if the management has a method of controlling each step. Each part of the process must be done on scheduled time so that material is never allowed to pile up and interfere with efficient work. The extraordinary development in recent years of mechanical methods of transporting material has made it possible for management to control production effectively. The last decade has brought remarkable development of power-driven methods of transportation. These include elevators, belts, chain carriers, inter-plant railways, motor trucks, a great variety of cranes, and other machines too numerous to mention. So complex has this problem become that the executive turns to the expert in this field for suggestions in selecting his equipment.

These mechanical devices lead to a saving in labor, and they make possible a more exact control over the distribution of material and over the entire process of production. The flow of material maintains a fixed rate of speed, and the time required for the process can be determined with exactness. Raw material is thus kept moving, the rate of production is controlled, the amount of supervision is reduced; and the labor problem becomes simplified. The management is now in a position to make predictions which are by no means guess work. If a successful executive is asked how he accomplishes what he does, he will probably say merely that he uses good judgment. What he really means is that he is proceeding along clearly defined lines; that he studies the vital problems concerned with his job of being an executive; and that every new phase of up-to-date operation of industry is a field which he immediately explores. Old fashioned methods of running business are of no more interest to him than old fashioned machinery. He plans for the future with the accuracy of the scientist.

A Commendable Endeavor

UNQUALIFIED commendation is due any individual or organization that endeavors to reduce the number of accidents occurring in industry. The project launched by The Explosives Engineer for a national competition to be carried on each year under the auspices of the United States Bureau of Mines is praiseworthy. The purpose of this competition is to promote safety in mining and quarrying operations. The award will be made each year of a trophy, Sentinels of Safety, which will remain in the possession of the winner for one year.

The trophy is perfect from the artistic standpoint, highly suitable in conception and convincing in its appeal. It portrays a mother with a child in her arms awaiting happily the safe return of her husband from work. The tablet below the figures on the pedestal will be used for recording the names of the mines and quarries which win the trophy from year to year. The unveiling of the trophy took place in New York City on May 20th in the studio of Begni del Piatta, the sculptor who designed it, and who has won a place of distinction with his work in the past. Everyone will be desirous of reducing the rate of accidents in 1925 and of aiding this enterprise which has so laudable a purpose.

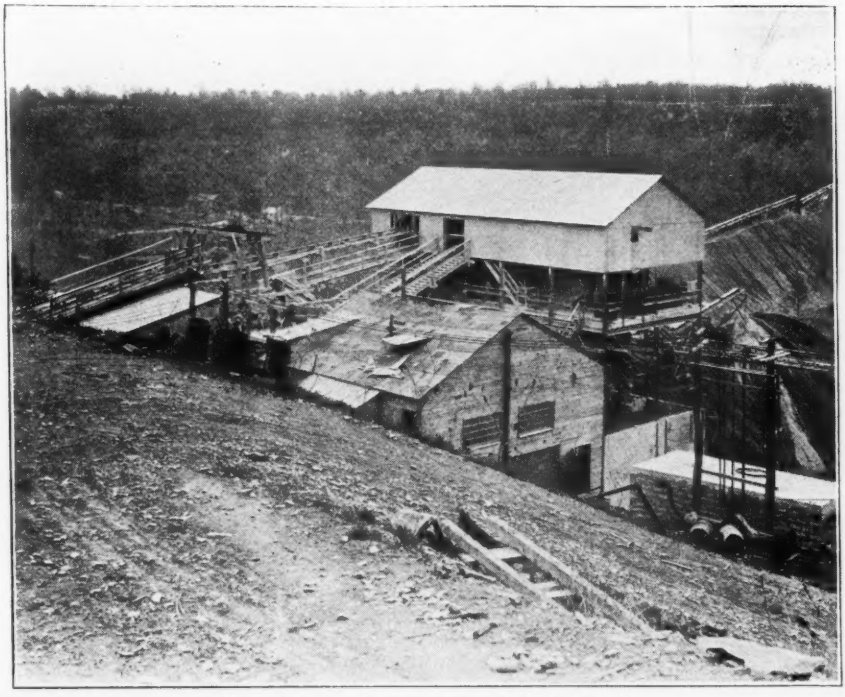
Utilizing Advantages in Operating Crushed Stone Plant

Rock Cut Stone Company Operating Modern Hillside Plant Producing 3500 Tons Daily Without Elevating Any Material

OPERATING both crushed stone and sand and gravel plants enables the Rock Cut Stone Company to dominate the market for these materials in their territory. This company operates three plants. One at Auburn, New York, produces 1500 tons of crushed stone daily. Another at Bollin, New York, produces 1200 tons of sand and gravel daily. The third plant at Rock Cut in Syracuse, New York, is the largest and produces 3500 tons daily. This third plant is not only the largest of the three but probably the most interesting, as it is a hillside operation and very efficiently laid out.

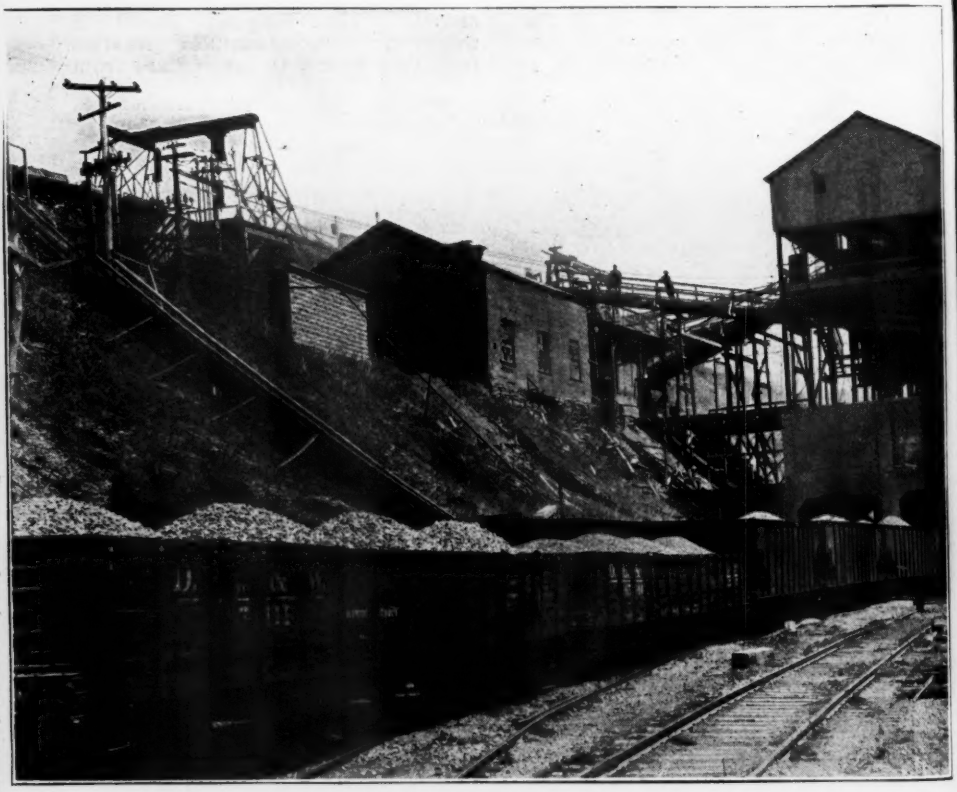
The quarry face in the hillside plant is about 1600 feet long with an average height of about 50 feet. There is very little stripping necessary, as the rock in general is exposed to the top. It is necessary to strip only where there are pockets of loam. There is practically an unlimited deposit of stone available. Drilling is done with two Keystone well drills and a six inch hole is drilled. Cordeau Bickford fuse is used in all deep hole blasting operations. Before operations start in the spring, the entire face of the quarry is shot so as to insure a good supply of rock. One of the illustrations accompanying this article shows a blast in which 26,000 pounds of Hercules dynamite were used, giving a tonnage of about 100,000 tons of stone.

The quarry is steam shovel operated, being equipped with one 78 C. Bucyrus and two 51 Marion steam shovels. The Bucyrus shovel is equipped with caterpillar traction mounting with both caterpillars front

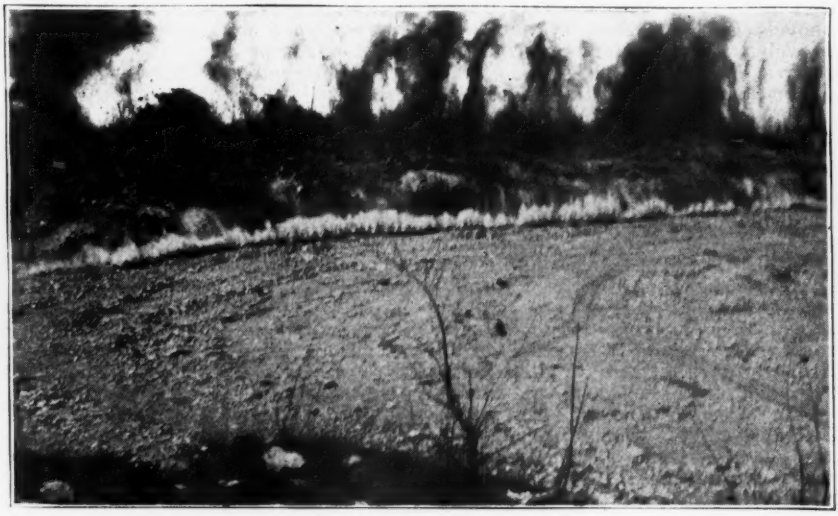


View Showing Screen House and Approach

Partial Results of Blast Referred To



View Showing Screen House, Conveyor



Blast Using 26,000 Lbs. Dynamite

System and Facilities for Handling Cars

and rear being driven. The Marion shovels are the wheel type traction shovels. A 10x16 Porter steam locomotive hauls five yard "one way" quarry cars to the initial crusher.

The plant is a hillside operation and the initial crusher, which is a 36 inch type N Allis Chalmers, is set below the quarry floor. The trains of quarry cars are hauled on a level with the quarry floor to a point above the initial crusher and dump with an air hoist. The stone coming from the initial crusher is passed through an 84 inch Allis Chalmers scalping screen. The fines up to ¾ inch are conveyed to Hummer screens for finishing. The intermediate stone up to 2¾ inch is conveyed to the screen in the screening house. The oversize is conveyed to secondary crushers, two of which are 14 inch Traylor crushers and the third a number 4 Allis Chalmers. After passing the secondary crushers the stone is conveyed to the screen house. The finished product from the 84 inch scalping screen is conveyed to the screen house on the same conveyor that transports the stone from the secondary crushers. The screen house is equipped with two 60 inch by 20 feet Traylor revolving screens and also Mitchell and Hummer vibrating screens. All stone from the two 60 inch screens which passes ¾ inches is finished by passing over a Mitchell vibrating screen. There is also a Sturtevant moto-vibro screen in the screen house. The screen house is a steel building and the lower part of the building has not been closed in. This arrangement allows the dust to be blown out and in general is an excellent layout as the dust is not confined in the building.

There are eight concrete bins for holding the different sizes of stone with a capacity of about 1000 tons. Railroad tracks run directly under these bins. There is a double track on two sides of the bins with room in back of the bins for holding 30 cars. These cars are dropped by gravity for loading and for storage. Truck loading is arranged for on one side of the bins and a truck scale has been installed to weigh trucks leaving the plant. A conveyor system is used in disposing of the surplus

View Showing Approach to the Initial Crusher. Note Air Hoist Used in Dumping Cars

Discussing Preparations for the Blast Which Resulted in 100,000 Tons of Stone—Using 26,000 Lbs. of Dynamite

Quarry View Showing 78C Bucyrus Equipped with Caterpillar Traction Mounting
Note the Well Drill on Top of Quarry

dust. This arrangement is shown in one of the illustrations accompanying the article. There are no storage facilities except for the ¾ inch stone which is stored by conveyor method in ground storage. Some of the belt conveyors in the plant are Robins conveyors and others are Stephens Adamson conveyors. There are no elevators in the plant.

Among the outstanding features of this plant are the shipping facilities. With ample storage space for cars and an efficient loading arrangement, cars can be handled with ease. The stone can move as fast as it is ready. There is really no need for storage bins. The trucking arrangement does not in any way interfere with the loading of cars.

Another fact worthy of mention is that the Rock Cut Stone Company has taken every advantage of the lay of the land. Conveying, of course, has been necessary but the material is not at any time elevated. All conveying is practically horizontal. As you can see from the illustrations, gravity could not be utilized as much as in some other hillside operations described in past issues of PIT and QUARRY. The nature of the deposit, the railroad shipping facilities and the type of plant desired need to be considered. It can be said that the Rock Cut Stone Company considered all these factors and have as a result a modern economical crushed stone plant producing an excellent stone for railroad ballast, road and building constructions.

The officers of the Rock Cut Stone Company are: W. L. Sporborg, President and General Manager; A. G. Seitz, Secretary; and J. F. Nash, Treasurer. Shipments from the Rock Cut plant are made over the New York Central Railroad and the Delaware Lackawanna and Western.

A new booklet issued by the Conveyors Corporation of America, Chicago, describes *Ash and Soot Disposal* at the Milwaukee Sewerage Plant, according to the Conveyors Corporation method.

The Pennsylvania Pump & Compressor Company of Easton, Pennsylvania, announce that James McGraw, Inc., 10th & Carey Streets, Richmond, Va., has been appointed District Representative for the Virginia territory.

Superheated Steam Handbook

A handbook on the generation and use of superheated steam has just been published by The Superheater Company, New York and Chicago. This is the sixth edition revised and supercedes the Data Book for Engineers. It is bound in Keratol, 4½x7 inches, contains 208 pages, 85 illustrations and diagrams, with 69 tables, and is sold for $1.00.

This handbook contains condensed data for steam power plant engineers and operators. A feature of the book is the index consisting of 16 pages, assuring ready reference. Superheated steam, its advantages over saturated steam, and the proper design and performance of superheaters, are briefly discussed. It illustrates superheater arrangements in practically all stationary, marine and locomotive type boilers commonly made in America. Waste heat, portable and separately fired superheaters are also shown. Brief comparative data is given as to sizes, tube sizes, arrangement of tubes, etc., for the stationary water tube boilers illustrated. The steam tables cover pressures from below atmospheric to 600 lb., absolute, and include properties of superheated steam from 50 to 300 degree F. superheat.

The section on piping includes information for figuring piping for handling water, saturated and superheated steam, and velocity and pressure drop of water and steam flowing through piping. In this section is included also the proposed American standards for high pressures. Superheat Engineering Data also contains engineering data on coal and oil fired boilers, which include tables of heat values for gaseous, liquid and solid fuels. Other miscellaneous data include complete conversion tables and data on bolts and screw threads, with the recent work of the American Engineering Standards Committee, and the National Screw Thread Commission. There are also many miscellaneous tables frequently used by steam engineers.

The Webster Manufacturing Company announces the opening of a branch sales office at 811 Magee Building, Pittsburgh, Pennsylvania. This office is in charge of Mr. E. E. Landahl who has been associated with this company for the past thirteen years.

Heavy Digging Revolving Quarry Shovels

By G. B. MASSEY*

IN the early days of development of the steam shovel, the builders in Europe concentrated largely on the small revolving shovels while in the United States the early development soon produced the two-truck railroad type shovel which for a great many years has held the supremacy as a fast, hard-digging machine. All of the dry excavation at Panama, the great part of the iron ore stripping and mining on the iron ranges, and the low grade copper properties, was done with this type of machine.

Then came the large revolving shovel with the very long boom and large dipper for stripping coal where the overburden could be overcast. These large revolving shovels were next adopted by the iron and copper mines resulting in the use of higher benches and a considerable advantage in transportation.

Shortly after the large revolving shovels had obtained a good foothold on the iron range, the railroad shovels in use there were equipped with caterpillar traction which eliminated several of the disadvantages of trucks and jack arms in that the pit men were no longer necessary, the runner could move up when he wished and as far as conditions warranted, and instead of stopping to pin up afresh from time to time, the shovels were able to dig on the caterpillars without jack arms. Also the shovels could be turned around and work back instead of deadheading and, of course, track sections were not necessary.

There were thus two distinct types of shovel competing in the hard digging class; first, the large revolving shovel on caterpillars, with long boom and large dipper; and second, the railroad type of shovel on caterpillars, with short boom and smaller, but very heavy dipper.

The logical result of such a competition has been the design and production of a very heavy revolving shovel, on caterpillars, with a short boom and very heavy dipper, combining the following advantages:

1. The shovel is mounted on caterpillar traction requiring practically no pit crew.

*Vice President, Randolph Perkins Company. Associate Editor, Pit and Quarry.

The Marion Model 125 Heavy Digging Shovel

2. The caterpillar traction enables the operator to move up when he wishes to do so and to move up the ideal distance each time instead of a fixed distance.
3. The delays due to moving up are eliminated.
4. The shovel can be run back to avoid a blast.
5. The full revolving feature enables the shovel to dig back in place of deadheading back or turning around.
6. It also results in a wider level floor and a greater dumping radius.
7. On a steam shovel the operator and fireman make up the crew, no cranesman being required, as the dipper is always in plain view of the operator who handles the thrusting engine throttle and the dipper door trip.
8. There is no tendency for the rear end of the shovel to lift because the caterpillar support extends out under the boom foot, and the point in the circle of swing at which the footing is best about coincides with the center of mass of the material to be handled for each move.
9. The shovel stands farther away from the bank than the railroad type does, and the dumping radius is appreciably greater. This means less liability of covering the loading track with a blast and also means more material handled at each move.
10. The operator does not have to slow up his swing as he comes to the loading position and spotting does not have to be done so accurately. This speeds up the work.
11. In pilot cut work, the shovel can load a car behind it in the cut.

By using two loading tracks in "thorough-cut" work, it is possible to have a train always ready to load without waiting for switching. The two tracks run up alongside the shovel, one on each side, and the shovel loads behind itself rather than alongside or on the corner as before.

The two shovels now on the market which possess in varying degrees the above advantages are the Bucyrus 120 B and the Marion Model 125.

In order to show the relations between the Bucyrus representative railroad type of shovel, the 103 C and the large Bucyrus revolving shovel 320 B, the principal data on each is given below with the same data on the new 120 B between them. It can readily be seen how the new shovel is a compromise between the two.

The Marion Model 125 data is given below, and if their railroad type of shovel and large revolving shovel were described, the new shovel would show the same compromise between the two.

Marion Model 125

Weight in working order	310000 lbs
Standard dipper capacity	3 yd.
Dumping radius	54′
Clear dumping height	35′ 10″
Level floor radius	34′
Radius of rear end of revolving frame.	22′
Width over caterpillars	19′
Main engines	10x12 dble.
Swing engines	7x 8 dble.
Thrusting engines	8x 8 dble.
Boiler	60″x12′
Boiler pressure	125 lbs.
Boom length	45′
Height of cut	44′
Effective pull on dipper	60000 lbs.
Diameter of swing circle	16′

	103 C	120 B	320 B
Weight in working order	239000 lbs.	290000 lbs.	761000 lbs.
Standard dipper capacity	3½ to 5	4	6
Dumping radius	31′ 9″	37′	91′
Clear dumping height above ground	19′ 6″	20′	64′
Level floor radius	20′	25′ 6″	59′
Length of car over all	43′ 7¾″	....	....
Radius of rear end	....	17′	32′ 10″
Spread of jack screws	21′	....	....
Width of caterpillars	....	17′	....
Main engine double	12½x16	11x12	14x16
Swing engine double	8½x8	7½x7	10x10
Thrust engine double	8½x8	7½x7	10x10
Boiler	54″x18′	70″x12′	80″x20′
Boiler pressure	130 lbs.	160 lbs.	135 lbs.
Boom length	30′ 3″	29′	85′
Height of cut	28′	29′	76′ 9″
Effective pull on dipper	84400 lbs.	60000 lbs.	85000 lbs.
Diameter circle	....	10′	30′

In each case, the machines are mounted on caterpillars, the Bucyrus on two and the Marion on four.

The lower frame is too large to ship in one piece and so has to be erected on the job.

The revolving frames are narrow enough so that the framework and machinery are shipped on a flat car as a unit and require only placing upon the lower frame. This means that all machinery is lined up in the shop and remains so. It cuts down the time of erection and means a better job of lining up.

The booms are of steel, the Bucyrus with box boom and outside dipper handles and the Marion with narrow dipper handles working through the boom.

No cranesman is required.

The Bucyrus hoist is single whip with two parallel equalizing ropes while the Marion has a three part hoist with single rope.

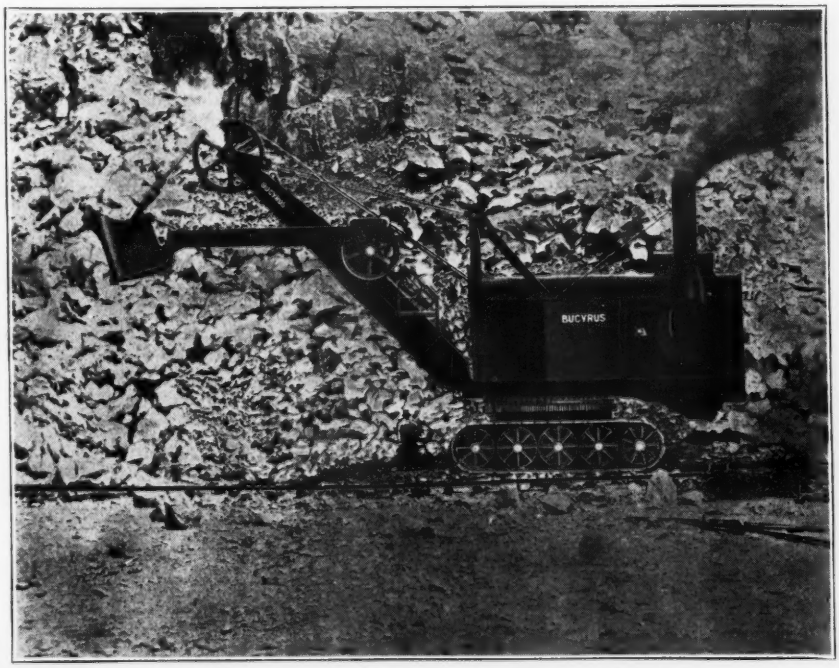
It would seem as if it would be almost impracticable to improve on these machines when driven by electric motors or with suitable Diesel engine drive as they are pre-eminent in:

1. Low labor cost.
2. Low power cost.
3. Low repair cost.
4. Large capacity in very heavy work.

Gypsum For Alkali Land

Mr. George W. Abel, of San Fernando and Palmdale, California, who is manager of the Palmdale Gypsum Company, plans to build a large loading chute and grinding plant on the company's five-acre holdings in Palmdale. The gypsum mines are only a mile west of the town, and the product, Palmdale Gypsum, is very rich in sulphur, and has been proven to be just what many ranchers in Antelope Valley need.

The mineral is a short crystal gypsum and will reclaim almost any alkali land, either white or black and make it harmless. It also breaks up the compact, tough clay and adobe and makes them loose and workable. Quite a little of this gypsum has been sold in the Valley, and demonstrations are being made in a number of alfalfa fields around Lancaster, and in the pear orchard at the Roy Hughes ranch in the Big Rock District.



The Bucyrus 120B Heavy Digging Shovel

Requirements for Masonry Wall Construction

A 57 page report on Recommended Minimum Requirements for Masonry Wall Construction has recently been issued by the Department of Commerce. The report was prepared by a committee of architects and engineers organized by Secretary Hoover in 1921 to draft recommended uniform building laws for adoption by cities and states throughout the country. It consists of three parts:

The first describes the committee's procedure in obtaining information bearing on this subject; preparing a report in tentative form and submitting it to those interested for criticism; and revising its recommendations after consideration of the constructive reviews thus obtained.

The second part presents a set of building code requirements for the regulation of masonry wall construction recommended for adoption or adaptation by those writing or revising building codes. These sections cover the quality of materials, maximum stresses for which masonry should be designed, matter of workmanship and the height and thickness of unstayed masonry walls both bearing and nonbearing. In general, the Committee's investigations disclose that thinner walls than those usually required in building codes are safe except under abnormal conditions of loading, wind pressure or seismic disturbances.

Extension tests of the fire resistance and crushing strength of various masonry materials and combinations were made at the Bureau of Standards and other places as a preliminary to the Committee's report on this subject. Summaries of those investigations and much other valuable information on masonry wall construction not otherwise obtainable in concise form is given in Part III of the Report. This Part also is intended as an explanation of the Code requirements advocated in Part II with the thought that their adaptation by code revision Committees and their administration by building officials will thus be considerably facilitated.

Previous reports of the Committee have received wide circulation and have been utilized in many cities and states. It is expected that the report on Recommended Minimum Requirements for Masonry Wall Construction will be welcomed by architects, engineers and builders.

Freight Loadings Show Decrease

Loading of revenue freight for the week ended May 30 totaled 920,514 cars, according to reports filed by the carriers with the Car Service Division of the American Railway Association.

Due to the observance of Decoration Day this was a decrease of 65,695 cars, under the preceding week, but an increase of 99,963 cars over the corresponding week last year. Compared with the corresponding week in 1923, however, it was a decrease of 12,170 cars. The total for the week of May 30, however, was an increase over the correspondinng weeks in 1920, 1921 and 1922.

Miscellaneous freight loading for the week of May 30 totaled 338,043 cars, a decrease of 25,191 cars under the week before, but an increase of 48,610 cars over the same week last year and 16,881 cars over the same week two years ago.

Grain and grain products loading amounted to 37,283 cars, a decrease of 1,339 cars under the week before, but 1,069 cars over the same week last year as well as 4,882 cars over two years ago. In the western districts alone, grain and grain products loading totaled 23,771 cars, an increase of 1,018 cars over the corresponding week last year.

A comparison by weeks follows:

	1925	1924	1923
May 30	920,514	986,209	820,551
May 23	986,209	918,214	1,015,532
May 16	984,916	913,201	992,319
May 9	981,370	908,213	974,078
May 2	981,711	913,550	961,617
April 25	959,225	878,387	962,578
April 18	922,778	876,916	970,042
April 11	917,284	880,937	945,271
April 4	922,375	861,990	896,375
March 28	931,395	907,389	896,735
March 21	909,363	908,290	916,818
March 14	924,149	916,762	904,116
March 7	930,009	929,381	905,344
February 28	862,910	944,514	916,624
February 21	925,295	945,679	830,187
February 14	902,877	935,589	816,646
February 7	928,244	906,017	849,352
January 31	896,055	929,623	865,314
January 24	924,254	894,481	896,464
January 17	932,150	894,851	864,297
January 10	932,807	872,023	873,908
January 3	765,727	706,292	727,246

Operating a Sand and Gravel Plant Under Exceptional Conditions

Written Expressly For PIT AND QUARRY By F. A. WESTBROOK*

THE COMBINATION of a large supply of material and a market right at the door is one of those ideal conditions which we sometimes hear about but seldom come in actual contact with. This however, is the state of affairs enjoyed by the Stamford Local Materials Company which operates a gravel and crushed stone business at Stamford, Connecticut. In addition to this great advantage, there is also every indication that when the gravel has been exhausted, the land will be salable for first class building lots.

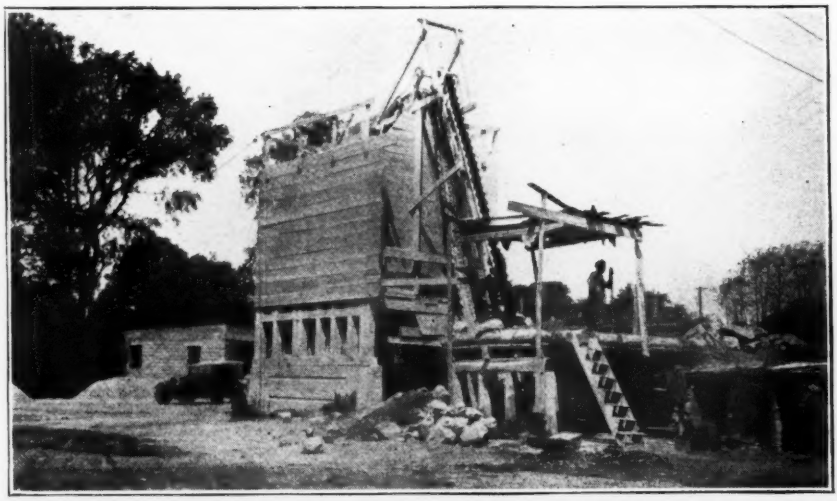
The property covers about twenty seven acres of what was once farm land. During late years the growth of Stamford, a prosperous and rapidly growing industrial and suburban centre, thirty five miles from New York, has pretty well crowded out farming but has created a great demand for materials for foundations, private driveways, highways and other similar work.

The location of these gravel beds is, therefore, unusually fortunate because there is no sales problem. In fact, there are no salesmen. The owner and his superintendent are both well known locally among contractors and builders, and their problem is really more that of making satisfactory deliveries than one of selling. It taxes the no mean ability of the superintendent to keep things moving satisfactorily without an undue investment in delivery trucks and machinery. How this is accomplished in so far as methods and equipment are concerned is easily explained, but the personal equation of the man in charge, which is, if anything, more important, must be largely judged by the results obtained.

When it is necessary to break new ground, a steam shovel is rented for the short time required to do this work. The material thus obtained is not of a very high grade, but it can easily be sold for filling-in purposes for enough to pay all the expenses of removal. All other manufacturing operations are completely electrified.

Most of the finer gravel is taken out by means of a Green Drag Line Scraper, operated by a thirty horsepower Crocker-Wheeler, 220 volt induction motor. It is capable of taking out from ninety to one hundred cubic yards per day of eight and one half

*Consulting Engineer.



Jaw Crusher at Right with Bucket Conveyor To Screen—Large Stone for Crusher is Dropped From Platform Where Man is Standing

Electrically Operated Dragline Scraper at Work. Operated by a 30 H. P. Motor

hours. The material is passed over an inclined grizzly which deflects the larger stones directly into a truck (Fig 2). This truck then carries the stones to the crusher unless cobbles are desired for some special job. The rest of the contents of the scraper drops into a hopper and is carried by a belt conveyor and bucket conveyor to a revolving sieve, which separates it into sand, ⅜ inch pebbles, ¾ inch pebbles, 1½ inch pebbles and tailings which later are generally taken to the crusher. The sieve and conveyors are operated by a ten horsepower General Electric induction motor, 220 volts. Of course, these various grades of material are dropped into bins under which trucks may be driven and loaded by gravity-feed.

Ordinarily the coarse stone obtained from the drag line scraper is not enough either to keep the crusher busy all the time or to supply the demand for crushed stone. Consequently another pit is used where the gravel contains a great many large stones and a small percentage of pebbles and sand. The crusher is located near this pit. This crusher is of the jaw type made by the Acme Road Machinery Company of Frankfort, N. Y., and is operated by a thirty horsepower Crocker-Wheeler induction motor. After the stones have been passed through the crusher, the crushed material is carried up to a revolving cylindrical sieve by means of a bucket conveyor, both operated by a ten horsepower induction motor. Here it is separated into pulverized stone, very popular for private driveways in this region, ⅜ inch, ¾ inch and 1½ inch pieces and tailings, all of which are dropped into separate bins under which trucks may drive and load by gravity.

There is a call for a certain amount

Rotary Screen for Dragline Scraper. Trucks Back Under These Bins and Load From Shute

of gravel which is a mixture of sand plus pebbles up to about 1½ inch in size. As not very much of this is required, it is in this operation most economically obtained by forking over the deposit in the pit containing the coarse material. This gravel mixture is placed in a pile to one side for future loading. The large pieces from this pit, suitable for the crusher, are loaded onto small trucks by hand and are dumped by them upon a platform directly over the jaw crusher. The tailings from the two sieves, and the large stones separated out by the grizzly at the drag line scraper are also brought over to the crusher by small trucks. There are two one-ton gravity dump Ford trucks used for this kind of haulage in the pits.

Care has been exercised in taking out materials to leave the bottom of the pits smooth so that trucks may be easily operated in any part of them. In fact, the operation consists of removing about twenty five to thirty five feet of the surface pretty evenly all around so that the progress of the excavating work really has the effect of increasing the size of the pit.

During the busy season, and that has been almost all the time during recent years except in winter, the output of the machines has just about kept up with the demand. Of course, during certain kinds of weather, especially rainy periods, it is impossible to operate the sieves. Alternate thawing and freezing also are a severe handicap. Consequently, the machines are kept in continuous operation whenever weather conditions permit, and at the comparatively rare times when there is slackening in the demand for materials, it

Belt Conveyor and Bucket Elevator For Carrying Material From Scraper to Screen

Loading Truck With Haiss Electric Loader—Note Flexible Cable at Extreme Right

is possible to build up a reserve stock (Fig. 8). During the autumn, an accumulation is made of cobble stones to run through the crusher in winter, which helps to keep up the general overall efficiency of the organization.

A striking characteristic of this plant is the orderly condition in which it is maintained. Mr. Varian, the superintendent, believes that the time thus spent is much more than repaid by the improved morale of the men and increased facility of carrying on the work.

Another interesting detail, showing how carefully things are organized to avoid losses in so far as practicable, is that on rainy days during the season when it is desirable to keep a full working force on hand, a considerable number of reinforced concrete fence posts are made.

The loading of trucks from reserve piles or from hand-forked piles of gravel and sand is accomplished by means of a Haiss Electric Loader. This will load a five ton truck in seven minutes with the help of two men, whereas it would take five men twenty five minutes to do the job by hand. Naturally this increases the efficiency of the trucks as well as of the men. Electrical power outlets are located on several poles conveniently situated about the premises into which a flexible cable carrying electrical power to the loader is plugged (Fig. 10).

Three phase power at 4000 volts is supplied by the power company to a bank of transformers located on poles outdoors which step down the current to 220 volts. The manner in which the high tension wires are brought into the small house containing the metering apparatus and how they are again carried out to the outdoor transformers is shown in the accompanying illustrations.

The cost of electrical power consumed amounts to only about $60.00 a month even during the busiest times. It is a striking instance of the economy of using central station service where this is readily available.

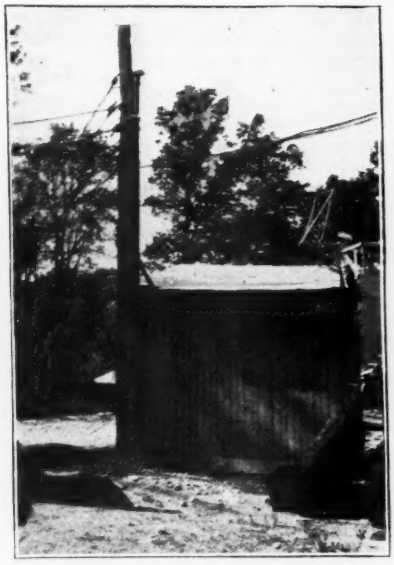
There are two five-ton trucks—one hydraulic hoist Bulldog Mack and one Packard—for making deliveries. The two one-ton gravity dump Ford trucks are used occasionally for making small deliveries but mostly, as already stated, for transportation around the plant.

With this small amount of equipment and only twelve employees, in-

Bins For Various Sizes of Material Graded By the Rotary Screen

Bank of Transformers For Stepping Down Current From 4000 to 220 Volts

View of Pit Showing Excellent Condition of Bottom

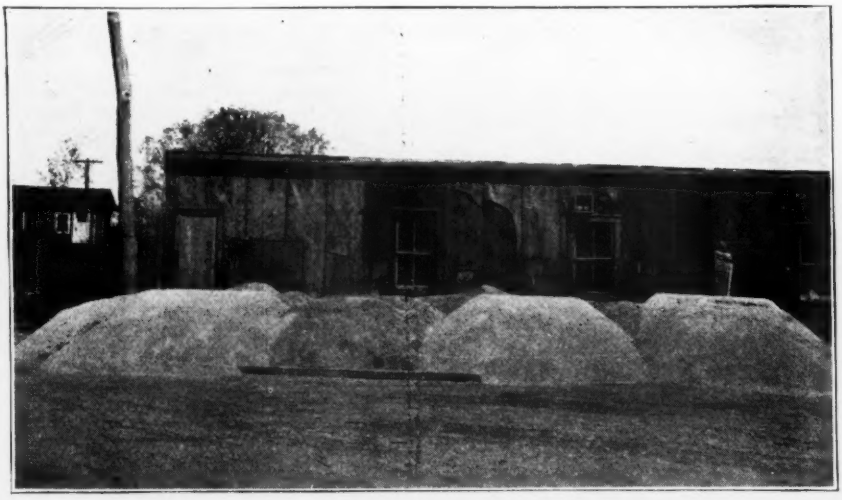


Building For Housing Electrical Power Metering Apparatus

cluding drivers and superintendent, approximately $5000.00 gross business is done during the months when construction work is active. The total for the year is now about $50,000.00 gross.

Possibbly one reason why this business has prospered in a very striking way has been due to the fact that it has been possible to undersell most competitors. This is the only large gravel bed in the vicinity so that other suppliers of this sort of material are obliged to bring it from a considerable distance from outside producers, involving charges for freight and additional handling as well as an extra profit, from which this concern is relieved.

The property was purchased five years ago for a very reasonable sum and upon very easy terms. This cost,



Piles of Reserve Materials Ready for Quick Delivery

plus the cost of machinery and trucks, amounting to approximately $20,000.00, was paid up out of earnings in less than five years. At the present rate of excavation the deposit will be worked out in about another five years. It is, however, not necessary to depreciate the original purchase price as the land will still be worth much more than that amount. This is because real estate all around these gravel beds is developing as a first class residential district at such a rate that by the time the raw materials are exhausted, the property will be salable for building lots. In fact, part of the ground has been left unbroken, for the present at any rate, because it is felt that it will be too valuable for building to disturb. Later on, if these expectations are not realized, the materials may still be taken out. Even now some thought is being given as to how the excavations may ultimately be made available for building—an entirely practicable possibility.

Fortunately the deposit is situated in a spot well hidden by trees and well out of sight from the immediate surroundings where the real estate development is taking place. The exclusive use of electric power has obviated any nuisance from smoke. Care has also been taken to avoid other nuisances to the neighborhood with the result that there has been no interference with the progressive development of the surrounding property along lines which constantly increase values.

New Sly Sales Office Opened

The opening of a new office is made by the W. W. Sly Manufacturing Co., at 215 Security Bldg., 44 Vernon Street, Springfield, Mass. This office has been established for the purpose of enabling the company to give their many customers in that territory more and better service.

Daniel L. Harris will be the Sales Engineer in charge. Mr. Harris' experience has been such that it will be of great assistance to the trade in the application of Sly equipment. Mr. Harris was educated at Dartmouth and Yale Colleges. He was formerly Assistant Sales Manager of the W. W. Sly Manufacturing Co.

New S-A Sales Office in Frisco

Announcement is made by the Stephens-Adamson Mfg. Co., of Aurora, Ill., that an S-A Sales Engineering Office has been established in San Francisco under the management of Chas. E. Bruff, formerly of the mining engineering firm of Bradley, Bruff & La Barthe.

This new San Francisco office is described as a result of the growth in capacity and number of friends of the S-A Pacific Coast Factory. Mr. Bruff's widespread knowledge of the mining, crushing and material-handling game coupled with the service he can give from the Pacific Coast Factory they say will assure excellent service to S-A customers and friends in northern California and Nevada.

The engineering firm of Bradley, Bruff & La Barthe of San Francisco has successfully engineered the building of many important plants for the large mining interests in the Western States and Alaska. In his affiliation with the sales engineering staff of the Stephens-Adamson Mfg. Co., Mr. Bruff's knowledge and exceptional engineering ability will be invaluable to customers and prospective customers.

Automatic Starters

Two new bulletins recently issued by the Electric Machinery Mfg. Company of Minneapolis are BULLETIN NO. 799 and BULLETIN NO. 785-A. The first is entitled "Automatic Starters for Synchronous Motors" and the second "Some Users of E-M Synchronous Motors."

"Progress has been rapid in the last few years," says the Introduction, "in the application of Automatic Starters to Synchronous Motors. Our first Automatic Starters were so far superior to manual starters as to insure their permanent success. This bulletin reports our recent progress in their refinement and application."

BULLETIN NO. 799 describes the self-starting synchronous motor, elaborating on Classification, Principles of Operation, The Frequency Relays, The Automatic Field Switch, Full-Voltage Starter, Reduced-Voltage Starter, Record of Performance, Protective Features, Demonstrations by Oscillograph, Source of Actuating Current, Special Features, Ratings, Construction Details, Applications and Results.

Mining and Milling Feldspar in North Carolina

Erwin Feldspar Company Owns and Controls Over 8,000 Acres Microline Species with Important Economic Value Mined

FELDSPAR as mined by the Erwin Feldspar Company of Erwin, Tennessee, is a hard, dense, crystaline mineral. It is usually white or nearly white in color, and it occurs in large dike formations. The mining of this mineral is somewhat difficult on account of its hardness, the angles of dip and strike, and the fact that great care must be taken in order to produce a high grade uniform product. The Feldspar group includes a number of mineral species consisting of silicates of aluminum with either potassium, sodium or calcium and sometimes barium. Besides the several distinct species there are many intermediate compounds having a certain independence of character and yet connected with each other by indeterminable graduations. All the members of the series show a close relationship not only in composition but also in crystalline form and optical characteristics.

The Erwin Felspar Company owns and controls in excess of eight thousand acres of high grade feldspar property in North Carolina, where they have a number of large and well equipped mines. Several of the species of feldspar have an important economic value. Mircroline, one of the species which is a silicate of alumina and potash, occurs in large quantities in Mitchell, Yancey and Avery Counties of North Carolina where the Erwin Feldspar Company mines this species on a very large scale.

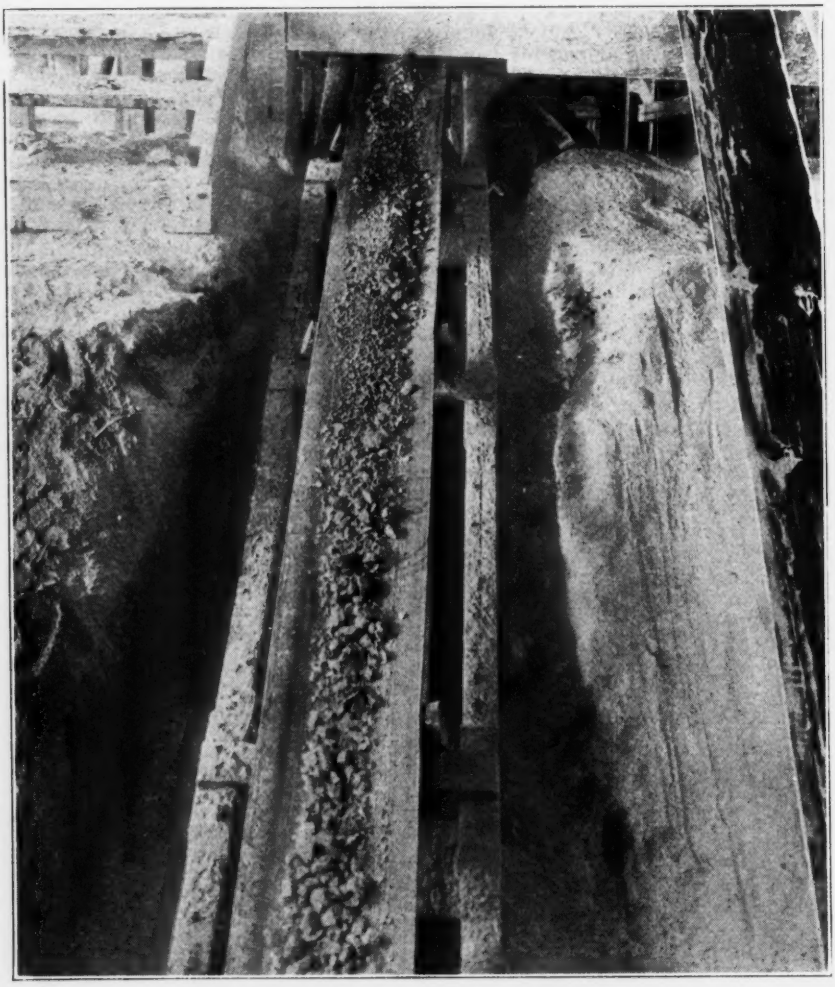
The mines of the Erwin Feldspar Company are located in the three counties mentioned above and from twenty to forty miles south of Erwin on the Clinchfield Railroad. Tram roads provided with small cars are used in transporting the crude rock from the mines to the main line of the railroad. The ore is then brought to Erwin where it is put through a milling process to reduce it to a fineness suitable for the trade.

The usual methods of open cut mining are practiced in mining the feldspar. Ingersoll Rand and Denver Rock air drills are used to drill holes down a considerable depth, a certain distance back of the face. The holes are then loaded with dynamite and the

The Feldspar Mill at Erwin

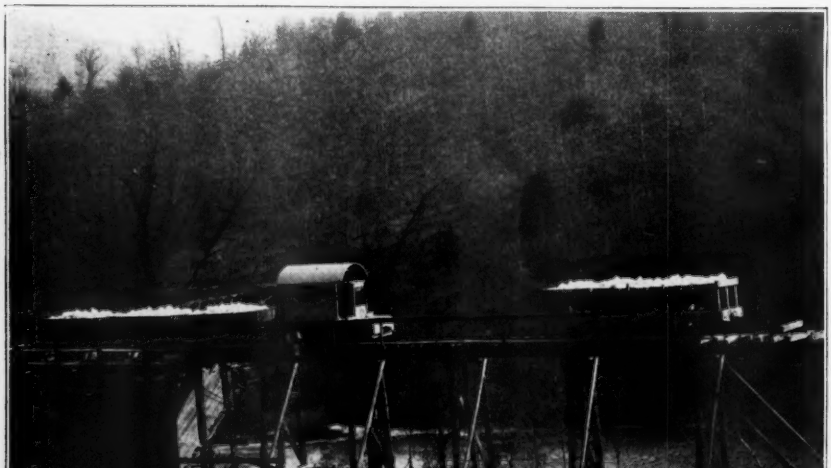
feldspar shot down. Air is furnished to a part of the mines from the company's own power plant. In this power plant a Pelton wheel is connected to a generator and an Ingersoll Rand compressor run by a motor. At some of the mines power is purchased from a local company to operate the air compressor. When the spar is shot down, it is hand cobbed and sorted. Only the selected spar is shipped to the mill. The remainder, which constitutes about thirty per cent of the total spar quarried, is discarded. The selected spar is loaded into the tram cars, transported to the Clinchfield Railroad and loaded into standard box cars for shipment to the mill.

At the mill the crude ore is crushed in either of two 11x22 Reliance jaw crushers manufactured by the Universal Road Machinery Company. From these crushers the ore is run through an American Process dryer where all moisture is removed. Fine dirt and other clinging foreign matter is also removed in this drying process. From the dryer the material is conveyed to Hardinge conical mills after passing over Dings magnetic separators which remove any tramp iron. There are



Conveying Ground Feldspar at Erwin

Two Mine Views—Open Cut Methods are Employed



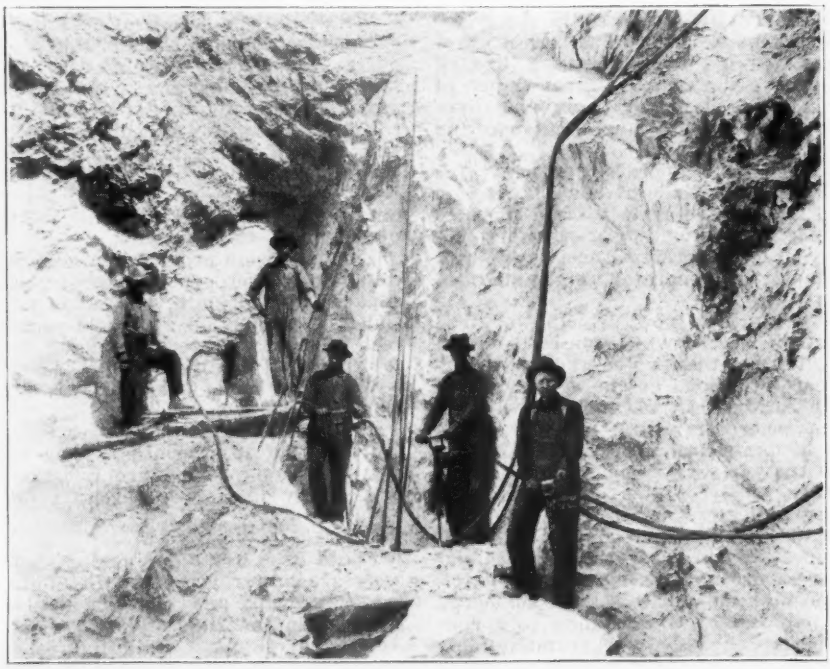
Hauling Team Cars to Railroad for Shipment to Mill

A Pile of Crude Feldspar

three of these Hardinge mills in the plant. At one time the feldspar was ground on chaser mills, burr stones, etc., but the Hardinge mills have supplanted these old methods. From the Hardinge mills the feldspar passes through the screens. The screening plant consists of Newago and Whip-Tap screens. The fines go to a 5x22 foot tube mill using Danish pebbles as the grinding medium. The tailings from this tube mill are returned to the Hardinge mills. This is called the batch mill as it is used intermittently. The belt conveyors are all of United States Rubber Company or Goodyear Company belting. All motors in the plant are General Electric with the exception of one 440 volt 3 phase 60 cycle Westinghouse.

The pottery, tile and sanitary ware trade requires the feldspar to be ground to 140 mesh; this means that there must be no residue left on a 140 mesh screen. The glass trade and some other users take material from 90 to 100 mesh. The Erwin Feldspar Company carries approximately 10,000 tons of underground ore in storage in their mill at Erwin. The grinding capacity of this mill is 3,000 tons per month.

Ground feldspar is used in the manufacture of floor, wall and decorated tile; in the manufacture of dishes; in the production of sanitary ware, such as bath tubs, wash basins, etc; in the production of enameled, granite and agate ware; in the manufacture of glass; as a flue dust arrester; in the manufacture of certain flooor coverings, such as congoleum; as a flux or a binding medium in certain grinding compounds; in the production of terra cotta and stoneware; in the manufacture of certain floor coverlain insulators; in the production of art pottery and in many other limited ways such as porcelain false teeth, etc. In glass manufacture feldspar gives the glass a greater lustre, adds to its mechanical strength and causes the glass to harden more quickly upon being blown or pressed into the desired shapes. These various trades or industries require spars that fuse at different temperatures. This temperature is expressed in terms of pyrometric cones. The Erwin Feldspar Company is able to meet these vary-



A Drilling Crew at One of the Mines

ing and exacting temperatures as they operate twenty different mines.

Feldspar was first produced in this country in a commercial way at Pendland, North Carolina, in 1910 shortly after the Clinchfield Railroad was put into operation. The industry has grown quite rapidly. Over 140,000 tons were produced in the United States in 1923, and about 40 per cent of this production was from North Carolina. The average price of this ore was $7.06 per ton. This production was an increase of 20 per cent in quantity and 23 per cent in value as compared with 1922. The average price in North Carolina, however, was only $6.34 per ton, while it was $9.20 in Maine. These figures are for crude feldspar only. The price paid in most instances depends upon the buyer's estimate of grade. Crude feldspar is usually sold on the long ton basis while ground feldspar is sold on the short ton basis.

New Portable Acetylene Generator

A small generator for producing acetylene at low pressure for welding and cutting has recently been developed by the Oxweld Acetylene Company, 30 East 42nd Street, New York. This supplements a line of larger generators, a great many of which are used to supply pipe lines in shops where much cutting and welding is done.

The new generator, which takes 35 lbs. of carbide at one charge, can be transported readily from place to place, thus providing a portable supply of generated acetylene gas. Empty, the generator weighs only 210 lbs.

An entirely new principle of feed control is used which might be called a "heavier-than-water" float. A vertical partition, extending nearly to the bottom into a water seal, divides the generator shell. One side is gas tight and contains the carbide hopper at the top. The upper part of the other side contains gas regulating and protective devices, and an automatic carbide feed control. Generation of the first acetylene causes water to rise on this side of the partition high enough to all but submerge a pan full of water, hung to a control lever. This pan normally acts as a weight acting counter to a spring, but as the water rises about it, its apparent weight is diminished and the carbide hopper valve is closed by the action of the spring. As acetylene is drawn off, water rises in the gas compartment and correspondingly lowers under the float, relieves some of the buoyancy under the water pan, which, gathering weight with the receding water, depresses the spring and allows a small amount of carbide to drop into the generator, and restore equilibrium conditions.

Because of its low center of gravity, the generator rights itself when tilted at an angle of 30 degrees. It works perfectly at an inclination of upwards of 10 degrees. No adverse effects result if a generator while in operation is knocked over. Nearly all fittings are enclosed in the cylindrical shell and there is little, if anything, projecting which may be injured by a fall on a concrete pavement.

This generator has been submitted to the Underwriters' Laboratories, Inc., and has been listed by them as an acceptable device for installation on insured premises.

Gypsum Tile for Interiors Being Produced

With the completion of a $20,000 expansion program, the Plastoid Products Company, at Twenty fifth and Downey road, has increased the capacity of its plant 50 per cent for the manufacture of gypsum cemented plaster lath and a new product has been introduced to the plastoid line, i.e., a hollow gypsum tile for interior partitions, according to Orville Routt, president of the company.

The expansion program, in addition to adding a 50 per cent production capacity for locklath, has made possible the production of 15,000 square feet of hollow gypsum building tile for interior partitions in Class A buildings, schools and churches, Mr. Routt declared.

The blocks are 12 by 30 with three, four and six inch widths. They are air dried and provide fire resistance and highly insulative partition material.

Foote Bros. Gear & Machine Company are now represented in Southern California and Arizona by the Fulton Engineering Company, 612 American Bank Building, Los Angeles, recently appointed as IXL distributors.

You also, can get this information from your HAND BOOK

CALCIUM PRODUCTS COMPANY

HOLLIDAYSBURG, PA.

MANUFACTURERS OF

HIGH CALCIUM CHEMICAL LIME

J. D. HARTMAN
MANAGER

March 9, 1925

The Complete Service Publishing Co.,
Rand-McNally Building
Chicago, Ill.

Gentlemen:

This will acknowledge receipt of your Pit and Quarry Handbook for 1925.

For your information, we have had business dealings with not less than twenty-five of the manufacturers listed, this company as well as the J. L. Hartman Company which have been under one management in the past. Your handbook has been especially helpful in covering as it does their entire lines of quarry machinery and supplies. The information it contains is especially helpful in many problems.

We feel under great obligations to you for sending us a book of so much useful information, and desire to thank you very kindly for same.

Yours very truly,

J. D. Hartman

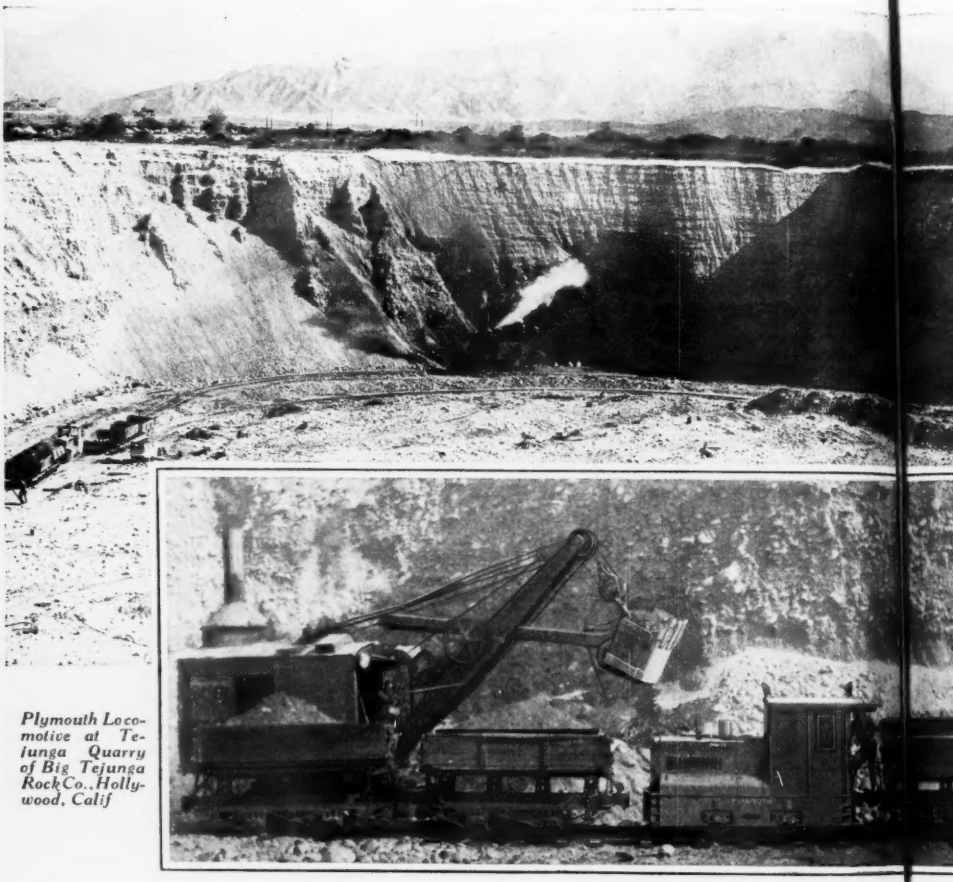
JDH-S

The habit of using Pit and Quarry HAND BOOK is a time and labor saving habit Within the covers of this book you will find the answers to your problems on operation and equipment. You will find information that can save you many a dollar and many an hour.

Pit and Quarry HAND BOOK

Rand, McNally Bldg. **Chicago, Ill.**

Plymouth Locomotives



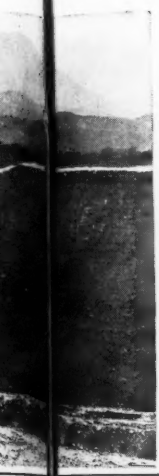
Plymouth Locomotive at Tejunga Quarry of Big Tejunga Rock Co., Hollywood, Calif

Out in California a list of Plymouth users reads like
In every state in the Union, Plymouths predominate.
It is their utility that enables them to thus predomin
Always ready, no coal nor feed to haul, no "lay up
pense—the Plymouth is fast displacing the mule, h
Made in 3 to 20-ton sizes, and in any track gage, t
When shall we ship yours?

THE FATE-ROOT-HEATH CO., *(Plymouth Lo*

Gasoline PLYM

redominate in California



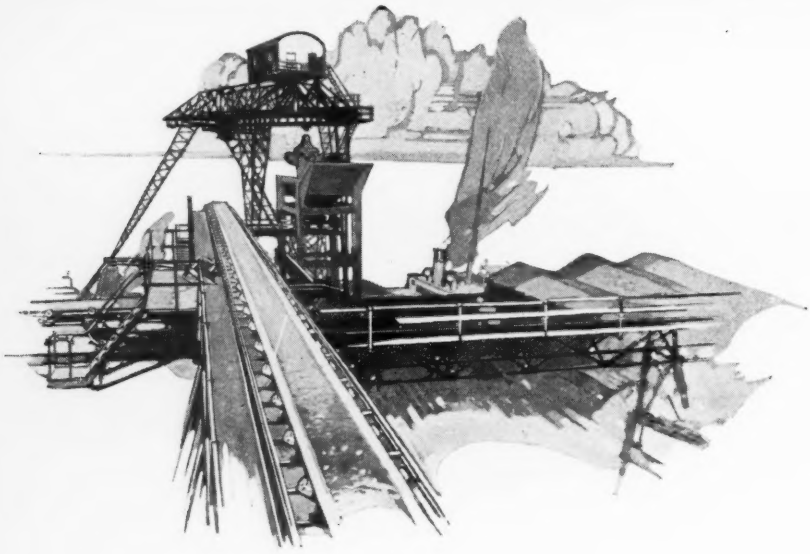
A Partial List of California Users
Many have placed repeat orders—
ask the user why

Alpine Lime & Gypsum Co.
Am. Crushed Rock Co. (2)
Amer. River Sand & Gravel Co.
Am. Trona Corporation
Arden Salt Co. (2)
Atlas Rock Co.
W. A. Bechtel
Belle Columbia Marble Co.
Bent Bros. (4)
Big Tejunga Rock Co.
Blue Diamond Material Co.
Builders Crushed Rock Co. (3)
Calaveras Cement Co.
Calif. Construction Co. (2)
Calif.-Guatemala Fruit Corp.
Calif. Rock Salt Co.
Calif. Salt Works
Callahan Const. Co. (2)
City of San Francisco
Consumers Rock & Gravel Co. (3)
Geo. R. Daley
Davidson Brick Co.
Eldorado Lime & Mineral Co.
Fenton-Parker Material Co. (4)
D. A. Foley & Co. (5)
Fontana Farms Co.
Gordon & Harrison (2)
C. E. Green
Happy Valley Irr. Dist.
Harris & Hull, Inc. (5)
Healy Tibbetts Const. Co. (2)
Hercules Powder Co.
Imperial Highway Comm'n
Inyo Development Co.
Kaiser Paving Co. (4)
Leslie Salt Refining Co.
Lincoln Clay Products Co. (4)
Los Angeles Rock & G. Co. (2)
Metals Exploration Co.
Monolith Portland Cement Co. (2)
Murray Canyon Rock & G. Co.
Natural Soda Products Co. (2)
Nelson & Sloan
Niles Sand G. & Rock Co. (2)
Old Mission Portland Cement Co
Orange County Rock Co. (8)
Pacoima Rock & Gravel Co.
Pacific Coast Borax Co. (3)
Pacific Gas & Elect. Co.
Pacific Distributing Co.
Pacific Portland Cement Co.
Peterson, Dillon & Patterson (2)
G. W. Preston
F. Rolandi (4)
Ross Construction Co.
Reliance Rock Co.
San Diego Electric R. R. Co.
Pacific Rock Co.
San Joaquin Light & Power Co. (2)
Santa Catalina Island Co. (2)
Santicoy Rock Co.
Service Rock Co.
Simons Brick Co. (7)
Southern Pacific Co.
Standard Oil Co.
Standard Gypsum Co. (3)
Stewart & Welch Const. Co. (2)
Stone & Webster Corp. (3)
Turlock Irrigation Dist. (6)
Union Tool Co.
West End Consol't'd Min. Co. (2)
Western Salt Co. (2)

ers rea like a Blue Book of California industry.
predo nate.
thus pr ominate.
, no "l g up," no boiler troubles, no "stand by" ex-
g the le, horse and steam dinky.
track g ge, to meet every requirement.

Plymo h Locomotive Works) PLYMOUTH, OHIO

MOUTH *Locomotives*



Here's a Way to Reduce Sand Handling Costs

On any job where sand and gravel is handled, a Brownhoist Belt Conveyor will cut handling costs and make possible an economy that is surprising through its remarkably low upkeep and maintenance costs.

For instance—excessive wear in a belt conveyor is invariably the result of friction and the point of greatest friction is the idler.

Brownhoist roller bearing idlers are fitted with Timken Roller Bearings and packed in grease which needs renewal but once a year. They are practically grit-proof, dirt-proof and friction-proof. Consequently these idlers, like all parts of a Brownhoist Conveyor, give long, economical trouble-free service.

Brownhoist engineers have helped reduce handling costs in many hundreds of plants. Their advice on any handling problem is yours for the asking—without obligation. Write for a copy of Catalog M on belt conveyors.

The Brown Hoisting Machinery Co., *Cleveland, Ohio*

Branch Offices: New York, Chicago, Pittsburg, San Francisco, New Orleans, London, Eng.

BROWNHOIST

MATERIAL HANDLING MACHINERY

Operating a Sand and Gravel Plant On a Large Scale

Producing 100 Cars Daily at Benton, Arkansas, Economically Ball Benton Gravel Company Operates Large Modern Plant

BENTON, ARKANSAS, is a thriving little city of 3,500 population. It is centrally located in Saline County, Arkansas, midway between Little Rock and Hot Springs National Park, Arkansas. The city is served by two large trunk lines, the Missouri Pacific Railroad and the Chicago, Rock Island and Pacific Railroad. This city is also located on the sixty-nine mile concrete road known as the Hot Springs Highway running from Little Rock to Hot Springs, Arkansas. Saline County is rich in gravel deposits. The largest of these deposits is at Benton and operated by the Ball Benton Gravel Company. This plant has an excellent market with very good railroad and truck facilities for reaching the market.

The Ball Benton Gravel Company was organized during 1917, producing at first only road gravel for the many roads being constructed over the entire state at that time. In the latter part of July 1923, a new sand and gravel washing and screening plant was completed. This plant has been in continuous operation ever since and up to the middle of May of this year had supplied 775,000 tons of gravel ballast to the Missouri Pacific Railroad. The plant has a daily capacity of 3,000 tons. Some additions have been recently installed at this plant in sand washing machinery. Sand separators were installed by the Stephens Adamson Manufacturing Company to take the place of two settling tanks. The installation of this equipment has enabled the company to increase their daily capacity about twenty per cent. A large percentage of sand is saved that previously had been wasted due to silt contents.

The source of supply is a bank

The Screening and Storage Bins

gravel cemented by a sand clay. This sand clay bond makes it possible to work the face with an almost perpendicular cut. The average height of this face is about thirty feet. The gravel is shot down with dynamite and loaded by steam shovels into Western dump cars. An Armstrong well drill is used in drilling. Six steam shovels are used in connection with the operations of the plant. A 70 C Bucyrus, a 60 Marion, a type B Erie, a model O Thew and a model 18 Osgood. An Erie type B Clamshell is also used.

Considerable gravel is also loaded into railroad cars at the pit for direct distribution as road surfacing material. That tonnage which is washed and screened is loaded into 12-yard Western dump cars and hauled by Baldwin locomotives to a hopper which feeds to a 110-foot Stephens Adamson belt conveyor through a Stephens Adamson steel apron feeder. The 100-foot conveyor carries the material to a Stephens Adamson revolving screen which separates the fine and course material. This screen is 48 inches in diameter and 8 feet long. The plates are punched with 2¾-inch round perforations. The coarse material passes through a number 5 Austin gyratory crusher.

The fines and the discharge from the gyratory crusher is conveyed by a second inclined belt conveyor an elevation of sixty feet to a Stephens Adamson rotating scrubber. This second belt conveyor was manufactured by the Stephens Adamson Manufacturing Company and is 306 feet long.

The rotating scrubber is fitted with high pressure water jets and is lined with vanes. The water with the mechanical actions breaks up and mulches the clay in the gravel. The scrubber is 48 inches in diameter and 10 feet long. It is equipped with blank plates which carry agitator angles and rings that aid in lossening the clay from the gravel.

From the scrubber the material passes into two 84-inch Gilbert type screens which are fitted with outer jackets. The inner barrel of each screen has 1½-inch round perforations. This screen divides the prod-

An Interesting View Showing the Trestle Work in Connection With the Conveying System

View Showing Facilities For Loading Cars

uct into three sizes, the material over 1½-inch, that which passes the 1½-inch perforations and is rejected by the ⅜-inch plates, and the finer which pass through the ⅜-inch holes in the screen jackets.

The fines and waste water are discharged into the newly installed Stephens Adamson sand washer which in turn discharge the washed sand

Partial View of the Rail Facilities

into bins. The storage bins are built of wood and fitted with Stephens Adamson gates for loading the material into cars. These bins have tracks on two sides making it practical to load two cars at one time. The washing process necessitates the use of 1,200 gallons of water per minute. This water is supplied by a pumping plant located on the Saline River about two miles from the plant. A six-inch Allis Chalmers direct connected centrifugal pump delivers the water through a ten-inch cast iron pipe to the plant. An auxiliary plant is located about seven hundred feet from the plant on Depot Creek. This plant also has a six-inch Allis Chalmers centrifugal pump. This pump during the wet season supplies sufficient water to operate the plant. Both pumping units are electrically driven. The plant is electrically driven throughout. The power is supplied by the Arkansas Light and Power Company of Pine Bluff, Arkansas. All pumps and motors in the plant are of Allis Chalmers manufacture.

The Ball Benton Gravel Company embarked in the sand and gravel business only after careful experiments had been made under the supervision of Mr. J. J. Ball, the President. Most of the large sand and gravel plants throughout the country were also inspected before operations were started. The officers of the company consist of John J. Ball, president, W. D. Cammach, Vice President and Charles M. King, Secretary.

The plant was constructed under the supervision of Glenn D. Douglass, engineer, for the company. The Ball Benton Gravel Company owns and controls about 400 acres of gravel deposit and is operating under a contract with the Missouri Pacific Railroad Company for road ballast. In addition to the washed gravel they supply a large percentage of gravel for road building. About 40 cars a day are shipped for this purpose. This company is now planning the construction of several new bins which will greatly increase the storage facilities. The principal offices of this company are located at Little Rock, Arkansas, although an office is also maintained at the plant.

Domestic Pumps

A new bulletin issued by the Domestic Engine and Pump Company of Shippensburg, Pennsylvanian Bulletin 25-MC contains up-to-the-minute descriptions of the famous Domestic pumps, hoists and compressors.

Among the units described are: Domestic diaphragm pump used extensively by contractors and others in handling clear or muddy water; Domestic trench force pump, a pump of large capacity for handling mud, silt, sludge, etc.; Domestic electric driven trench pumps; Domestic force pump units, high pressure, for pumping into elevated storage tanks or through long horizontal pipe lines; Domestic force pump units, medium pressure; Domestic deep well pump units. Domestic portable air pressor units with table of specifications occupies a page; and Domestic light, medium and heavy duty hoist units, with table of specifications, a page.

A New Link-Belt Service

Link-Belt Company of Indianapolis, Chicago and Philadelphia has just announced that after many years of work and study of the problem of standardizing and manufacturing silent chain drives for stock, it has placed in operation a new plan by which complete lines of silent chain drives of from one quarter to ten horsepower, in practically any reduction from one to one to seven to one, are now available for immediate delivery, by distributors located in many principal cities of this country.

Back of these distributors will be immense stocks carried in reserve in the warehouses of the company's factories at Indianapolis and Philadelphia.

For more than twenty years the installation of silent chain drives has been an engineering problem. Under the Link-Belt plan it remains somewhat of an engineering problem, but one which has been simplified in conveniently arranged tables, which have been published in book form for distribution by this company.

The stock drive chain is of the same high standard of quality, as those that are built for special application. The patented bushed joint construction is the same in the standard stock drive chains as it is in the standard Link-Belt silent chain used for the past 20 years for industrial drives.

The Railroad and the Motor Truck

Written Expressly For PIT AND QUARRY By J. H. DONNELL*

THE PASSING years evidence progress in science, in industry, in all things which contribute to the betterment of living conditions. The motor vehicle is an outstanding development of the twentieth century, and with its gradual perfection is playing a role of ever increasing importance in our industrial life. The development of short haul highway traffic by trucks is an inevitable consequence of the motor truck's proved utility. Industry always has and always will devise ways and means of securing maximum utilization of mechanical inventions and devices for cutting costs, increasing production, expanding sales and volume of turnover.

Industry has always looked to the steam railroad for efficient transportation of the bulk of tonnage, and it is certain that this condition will continue in spite of highway traffic development because the railroads are awake to the potentialities of the motor truck and have already made great strides in adapting it to their needs, in order that they might continue to serve the shipping public effectively in every phase of transportation. Moreover, they are finding the truck to be a valuable adjunct to the business of transportation and are advantageously coordinating its utility with their rail facilities.

The recent application of the B. & M. R. R., filed with the Interstate Commerce Commission, which asked permission to abandon more than a thousand miles of line, is indicative of the type of territory most effectively served by highway transport. Furthermore, the activity of the B. & M. in providing motor transport for much of this territory leaves no doubt that the railroads are going into the motor transport business in a rather large way.

The logical usefulness of the motor truck is in the field of short haul traffic. This fact is not only being demonstrated by the B. & M. but by the New York Central, the Pennsylvania and other class 1 railroads, through their experiments with highway transportation as supplementary to rail service. In some cases the carriers find it advantageous to own their own trucks, in other cases to employ the facilities owned by established motor transport companies.

G. C. Woodruff, G. F. A., New York Central Railroad, in speaking of the motor truck activities of his road, says,

"We have approximately 50 separate trucking activities with about 600 trucks under way at varying rates and without exception the undertaking is being worked out with local motor trucks and trucking concerns already established, and as we have worked it out up to date the use of the already established motor truck lines seems preferable to endeavoring to either do the work ourselves or bring in any new organization. The benefits are manifest but particularly in the retention of goodwill and the failure to upset any organized commercial activity.

"So far as our experiments have gone along and particularly where we have reason to feel that the specific undertaking is a success, we continue to hold the view that the railroad, or even a subsidiary, cannot best undertake to perform the trucking but that it can be best done through already established agencies.

"Based on nearly two years of experimental undertakings I feel it can be safely said that a place, and a very large place, has been found for the motor truck as a useful and highly appreciated adjunct of the railroad, particularly of the railroad with which I am connected for we feel that only a beginning has been made and that what has been done is but an indication of what can and probably will be done in the relatively near future."

Briefly stated, the New York Central has found that the motor truck may be used to advantage in six principal ways:

1. Station to station hauls in lieu of way freight.
2. From stations on one division by cross haul direct to a station or transfer on another division to avoid rehandling at intermediate transfer.
3. From the smaller to the larger stations to make possible straight

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carloading with consequent improved time and saving in expense.

4. Haul from a central delivery station to small outlying station where final delivery is made to the consignee.
5. Interchange between railroad and steamship lines and cartage in lieu of lighterage.
6. The trucking of unit containers for L. C. L. merchandise and carload coarse commodities.

Other roads are using the motor truck for these same purposes and as time goes on will find other ways in which the motor vehicle can be of real economic value to the steam and electric railroad.

It should be borne in mind that the motor truck as a general carrying agency has certain limitations. It is not adapted generally to long haul traffic. Generally speaking, the railroads depend upon through long haul traffic for the bulk of their revenues, and the motor truck cannot be considered a competitor of the railroad in this field. Moreover its utility in certain sections of the country is dependent upon road conditions and in the winter months upon weather conditions.

The Department of Agriculture is making an exhaustive study of the potentialities of highway traffic. Much has already been accomplished through traffic surveys in different parts of the country and this work is being carried steadily on under the direction of Dr. J. Gordon McKay, Director of the Bureau of Public Roads.

Secretary of Agriculture Jardine in an address delivered before the Mid-West Transportation Conference in Chicago, May 28th, said,

"On the basis of what we have already found I feel that I can talk to you as one having authority in regard to some of these matters on which there are so many opinions. In other words, we have the definite facts.

"One thing we know very definitely there is no basis for the fear that the motor truck is going to compete seriously with the railroads. The facts we have found in all our surveys are sufficient to convince me. The truck has found its place in the short haul, and it is not taking over any business that the railroads can do as well or better."

In its Connecticut survey, the Bureau of Public Roads found that nearly 40 per cent of the total truck tonnage is moved less than ten miles and nearly 70 per cent is moved less than 30 miles. The relatively small movement which runs to 100 miles and over is largely furniture and household goods in which promptness of delivery and minimum handling are the controlling factors.

It was found in Connecticut that two factors are generally responsible for the transportation of commodities by truck for more than 30 miles. The first is the lack of rail service supplying quick and dependable L. C. L. transportation. The second is that certain commodities, notably furniture, but including also groceries, meat and vegetables distributed from the cities to the smaller towns, are in their very nature adapted to motor truck shipment.

All across the country the same situation is found, any differences being in degree only. In California it was found that 25 per cent of the total truck tonnage is hauled less than 10 miles and 60 per cent less than 30 miles; the tonnage that is hauled more than 70 miles, constituting less than 20 per cent of the total. The greater percentage of long distance hauls in California is apparently due to the greater distances between cities and the less complete service afforded by the railroads.

In Cook County, Illinois, a striking similarity to other sections of the country is discerned. Here 24 per cent of the movement is less than 10 miles, 75 per cent less than 30 miles, and less than three per cent moves further than 100 miles. These three illustrations show the facts pertaining to the length of motor hauls in three representative areas, in as many widely separated sections of the country. They prove very conclusively that the truck is not competing with the railroad in the long-haul field.

Long haul competition has been tried out, but not successfully. One reputable and financially strong company tried it and failed signally to make a go of it. They operated a fleet of 35 trucks averaging 3½ tons and kept an accurate record of costs. These trucks ran between Buffalo and Erie and between Erie and Cleveland. In each case the distance was about a hundred miles. Their rates were based on the railroad tariff, slightly higher for

the low grade commodities and slightly lower for the high grade traffic but adhering pretty closely to the level of the rail rates. Their gross revenues for one year were $200,000.00, their net loss was $14,000.00.

That motor trucks are not destined to compete with the railroads for long hauls does not in any way detract from their value as an economic factor in the scheme of commodity distribution. They have a place peculiarly their own. That they afford economical and efficient short haul transportation is indisputably evidenced in their ever increasing number, and it is their peculiar effectiveness in this field of transport that more than anything else will tend to impel the railroads to use them freely.

It is of the utmost importance that good roads be provided and adequately maintained in order that the motor truck may serve business and the individual to the maximum limit of its capacity.

The question of financing highway construction and the apportionment of the expense of construction and maintenance is a subject of infinite possibilities and provides a rich field for intelligent research. Athough much has been accomplished through state, county and federal cooperation, yet much remains to be done in order that a farsighted and permanent program of construction and maintenance may be adopted, a program that will embody the results of intelligent and well informed thought in order that maximum results may be secured without the imposition of undue burdens on any one.

Dean Hill Pump Appointment

The appointment of the Stewart Machinery Company of 411 Buder Building, St. Louis, Mo., as their local dealer in the St. Louis territory is announced by the Dean Hill Pump Company of Anderson, Ind. Mr. E. C. Werner of Woodlawn, Cincinnati, Ohio, has been appointed local representative in the Cincinnati territory.

W. C. Davis, President, and F. P. Callaghan, Chief Engineer of Foote Bros. Gear & Machine Co. of Chicago, recently returned from a ten day trip through the East, during which they attended the Convention of the American Gear Association in Pittsburgh.

Building Activity During May

Building continues at a record-breaking rate, according to F. W. Dodge Corporation. Contracts awarded last month in the 36 Eastern States (which include about seven-eighths of the total construction volume of the country) reached a total of $496,024,100. This was the second highest monthly total ever recorded, having been exceeded only in April of this year. There was a decline of 9 per cent from April, a seasonal decline in May being customary. There was at the same time an increase of 18 per cent over May 1924.

Last month's record included the following important items: $231,182,200, or 47 per cent of all construction, for residential buildings; $80,280,100, or 16 per cent, for commercial buildings; $77,759,400, or 16 per cent, for public works and utilities; $29,312,700, or 6 per cent, for educational buildings; and $27,562,000, or 6 per cent, for industrial plants.

Construction started during the first five months of this year has amounted to $2,119,564,100, an increase of nearly 10 per cent over the corresponding period of last year.

Contemplated new work reported in May amounted to $712,853,000, an unusually large amount for so late a month. It was only 6 per cent under the April figure and it was 24 per cent over the amount reported in May of last year.

Bureau of Standards Expert Starts Weighing the Earth

Does the earth, as scientists have calculated weigh 6,000,000,000,000,000,000,000 tons? And, if it does not, how much does it weigh? This is the problem that Dr. Paul R. Heyl of the United States bureau of standards, the most accurate organization in the world, is attempting to solve. In order to get an approximately correct solution, Dr. Heyl has set up apparatus in a cell about thirty-five feet below ground at the bureau, and has been at work at odd times for nearly a year. It probably will be many weeks before he completes his work. Dr. Heyl's cell underground is air tight and he works in it only for short periods at a time.

Correcting a Mistake in Plant Layout

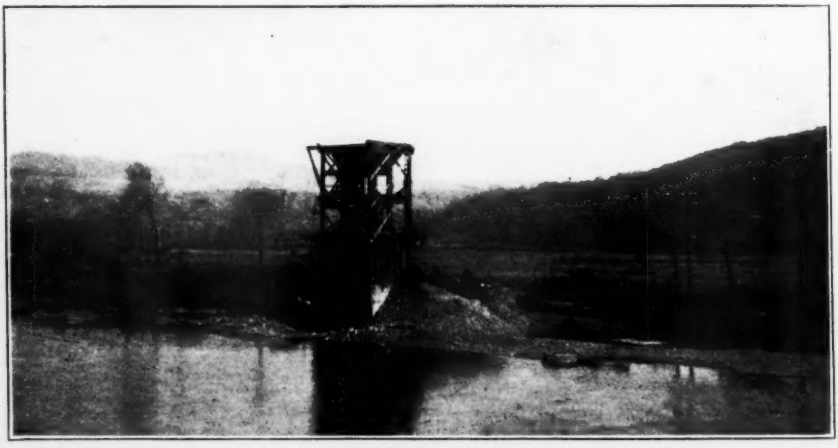
MISTAKES are frequently made in laying out plants. Some of them are never corrected. When a progressive company, realizing that it will suffer year after year because of an error in the original plans, makes changes that take care of the situation, it becomes a valuable object lesson for others. Such is the story of the recent changes made by the General Concrete Products Corporation.

New Mast in Position Without the New Cableway Attached

The New Plant With New Mast Going Up

This company was organized and its plant erected in 1922. The digging and washing plant was located on the south side of the Allegheny River. It was necessary to convey the finished material by cableway across the river, a distance of about seven hundred feet, to stock bins. Then from the stock bins the material had to be conveyed over a hundred-foot tunnel containing a sixteen-

(*Continued on page 78*)



View Showing the Old Washing Plant

Blasting Practice in Quarry And Open Pit Mining

Written Expressly for Pit and Quarry, By R. N. Van Winkle*

Part II

THIS is the second of a series of six articles. The first appeared in the June first number of PIT and QUARRY. In the first article Mr. Van Winkle discussed the action of explosives, kinds of explosives, selection of explosives and amount of explosives to use. Readers are invited to correspond with Mr. Van Winkle in relation to these articles or to blasting problems in general. The editor of PIT and QUARRY will be pleased to receive comments or data on this subject from readers whose experience and knowledge will be of value in the study of blasting practice.—EDITOR.

Size of Cartridges

The diameter of the drill or bore hole regulates the sizes of the explosive cartridge that can be used. Dynamite is packed in standard sizes of cartridges ranging from ⅞ inch in diameter and 8 inches long to 5 inches in diameter and 16 inches long. Various sizes are intermediate. Some restrictions are imposed by railroads and common carriers in shipping the larger sized cartridges in certain grades. In selecting size of cartridges to be used it is good practice to buy as large a cartridge as can possibly be used; first, because the manufacturer makes a dense packing and with the large cartridges there will be fewer voids in the bore hole; second, because you have fewer cartridges to handle when loading a drill hole; and third, because you are buying less paper and more explosive when using large, instead of small cartridges, as dynamite is sold by the case of 50 pounds, paper weighed in. It is a known fact that manufacturers of explosives have for a long time tried to educate the consumer of commercial high explosives to the advantages of large and the disadvantages of small sized cartridges. Among the many reasons brought out by the manufacturers in favor of larger sized cartridges are the claims that small sized cartridges are less efficient, more dangerous and deteriorate much more quickly. There has been a tendency on the part of mechanical drill manufacturers to recommend small diameter drill holes in order to make a better showing for their machines in lowering drilling costs and gaining footage drilled. Small drill holes require smaller diameter cartridges and should not be encouraged or practiced. In secondary shooting small sized drill holes and small sized cartridges, even as small as 1 inch in diameter and 4 inches long have met with favor and are being used quite extensively. In both primary and secondary shooting, especially in primary work, cartridges of such diameter should be used as are just small enough to permit of their getting to the bottom or the back of the bore or drill hole without unnecessary jamming. In this way all chances of air pockets or spaces can be eliminated; this is highly desirable in hard shooting ground. The writer is a firm advocate of using the largest sized cartridges possible both as to diameter and length. If work will permit, cartridges 16 inches in length or more are to be recommended. Tests carried out have shown conclusively:

1. That the rate of detonation and sensitiveness to explosion by influence increases with the increase in diameter of cartridges.
2. That gelatin dynamites rapidly decrease in sensitiveness to detonation and explosion by influence on ageing, while ammonia dynamite is very little affected.
3. That the sensitiveness of gelatin dynamite to detonation and explosion by influence on ageing proceeds more rapidly the smaller the diameter of the cartridge.
4. That the insensitiveness to detonation and explosion by influence proceeds more rapidly with 60 per cent strength L. F. gelatin dynamite than with 40 per cent strength L. F. gelatin dynamite.

From the above it is apparent that safety from misfires is effected through the use of large diameter cartridges for reason of the greater

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sensitiveness to detonation. Also, with the use of large diameter cartridges there is less likelihood of partial failures due to foreign substances in the bore hole, for reason of the greater sensitiveness to explosion by influence.

Very often reference is made to high cartridge count explosives. This expression ordinarily means the number of cartridges of a given size, strength or grade contained in a 50 pound case of commercial high explosives. While it is impossible to fix definitely the limits on the cartridges in a case, the following table, "Densities of Explosives," will serve to give a fair idea of the number of cartridges of different sizes, strength or grade contained in a 50 pound case. The table covers, as well as possible, all standard grades of commercial high explosives suitable for quarry and open pit blasting. In using the table one should bear in mind that cases sometimes contain as much as 10 per cent more than the number of cartridges listed in the table. As a general rule Straight Nitro-glycerin explosives will pack in cases quite closely to the minimum number, while Extras will run closer to the maximum per case.

Explosive Costs

The initial cost of high explosives should not be the primary consideration under ordinary conditions. There was never anything made that someone could not make it worse and sell it for less. It is excellent logic to stick pretty closely in the choice of explosives to the tried and recognized standard makes and strengths. There is generally something manufactured in standard brands that will undoubt-

DENSITIES OF EXPLOSIVES

Kind and Grade of Explosives	Size of Cartridge and number to each 50 Lb. Case												
	⅞″x8″	1″x4″	1″x8″	1⅛″x8″	1¼″x8″	1½″x8″	1¾″x8″	2″x8″	4″x8″	5″x8″	4″x10″	5″x10″	5″x17″
Straight Nitro-Glycerin	208		160	128	105	72	54	41	11	7			
Extras or mixtures of Ammonium Nitrates and Nitro-Glycerin (a) Dense	208		160	128	105	72	54	41	11	7			
(b) Bulky	285		228	190	155	105	77	58	15	10			
Gelatin and Extra Gelatin (a) 80% and above	188		146	117	96	64	49	37	10	7			
(b) 60 & 75%	183		140	113	91	62	46	35	9	6			
(c) Below 60%	175		135	109	88	60	44	33	8	6			
Low Powders F; FF; FFF.	195		153	121	100	68	53	39	10	7			
R. R. P.		See	note	below									
Special Dynamites 30, 35, 40 and 50%			167	135	109	75	55	42	11	7			
60 and 70%	233		180	143	117	81	60	45	11	7			
Starch Dynamites (a) 30%	203	325	159	128	101	72	52	42			9	6	3
(b) 40%	217	338	167	136	107	76	57	44			9	6	3
(c) 60%	233	367	183	146	116	81	62	47			9	6	3

Note: R. R. P. is granular in form and packed in 12½-pound paraffined paper bags, 4 bags, 50 pounds to the case.

edly be suitable to conditions encountered. It is not claimed that new explosives, and good ones too, will not come on the market in the future, for unquestionably they will, but to act slowly in accepting them is good policy. In the purchasing of explosives you are buying potential energy. Blasting costs should be based on per ton or per yard of rock or ground shot to the proper size for handling economically. Successful blasting operations do not mean the mere moving or shooting of so many tons of material, but the reducing of the material by the use of explosives and drilling operations to the sizes that can be handled and which fit in with the other factors of your operations. The greater the volume of material reduced to proper size by primary blasts, the cheaper the explosive or blasting costs. As you approach more nearly to perfect primary blasts, secondary shooting costs will be reduced accordingly.

Commercial high explosives under ordinary conditions are sold by weight; black powder in cans or metal containers, and dynamite in wooden cases. Dynamite is generally sold in case lots containing 50 pounds net of explosive. It is not a bad idea to weigh occasionally the contents of a case or perhaps two or three cases in a shipment as a check on receiving what you are paying for. Manufacturers do not make a practice of giving short weights, but occasionally in the packing of cartridges and in the filling of cases incompetent help or poor supervision may be the cause of the delivery of cases of high explosives which are short in weight. In such cases all that is necessary is to save the case and contents and notify the manufacturer who will make adjustment. This practice of weighing an occasional case of explosives is good business procedure and is not followed rigidly enough by the average user of high explosives.

Explosive waste is enormous. While there is no tangible way of determining what this waste amounts to, the writer has canvassed the situation among manufacturers of commercial explosives and finds that a fair average as estimated by them is 30 per cent. It appears that the manufacturers would minimize this figure as much as possible, but every manufacturer and student of explosive handling and use knows that practically one third of all commercial high explosives are absolutely wasted. This waste is traceable to many causes: lack of knowledge of explosives, lack of proper supervision in using, use of wrong brands and strengths, improper drilling, wrong methods of shooting, improper storage of explosives, use of cheap and improper help, too much hurry in drilling and loading, and use of too much explosive where not needed. This is only a partial list of the causes but will serve to suggest some of the places where this approximate 30 cents of every dollar spent for explosives might be saved.

How to Figure a Shot

In laying out a bank shot it is well to remember something of the rules and practices employed in the old plug and feather method of quarrying. Bank shooting, where well drill holes and commercial explosives are used, is quite similar to this old time method. By the plug and feather method holes were drilled in a line and spaced a shorter distance apart than the distance back from the face, and eventually the stone being plugged and feathered was shoved loose. In bank shots well drill holes should be spaced closer together than the distance back from the face and the block of stone to be shot sheared off as squarely perpendicular as is possible. Of course, in bank shooting the stone must not only be sheared off, but shattered and broken up at the same time. Often too great a burden is attempted in bank shooting, and that is where the practices of plug and feather operations are applicable. In other words do not attempt in drilling and blasting operations to "bite off" more than your explosive charge "can chew" or fragmentate properly. That experience is the greatest teacher is truly applicable in drilling and blasting operations, as practices that may be highly successful in one location may be flat failures in others.

After you have determined by experience or trial the number of tons of stone one pound of a certain grade or strength of explosive will properly shoot or fragmentate, it then is a matter in bank shooting of locating your drill or bore holes at advantageous points along your quarry face so that the amount of explosives to be loaded hereafter in each hole

Number Cubic Yards of Material in the Solid Displaced per Foot of Hole at Different Spacings for Verticle Faces

DISTANCE HOLES ARE SPACED APART IN FEET

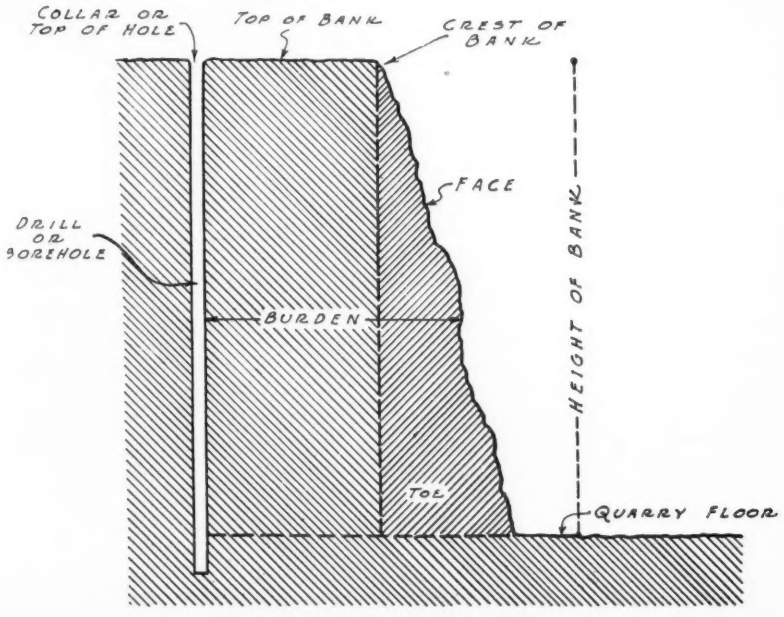
DISTANCE HOLES ARE SET BACK FROM FACE IN FEET	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
7	1.81	2.0	2.33	2.7	2.85	3.11	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
8	2.0	2.37	2.65	2.96	3.26	3.55	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
9	2.33	2.65	3.0	3.33	3.66	4.0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
10	2.7	2.96	3.33	3.7	4.1	4.44	4.81	5.18	5.55	5.92	....	....	....	....	....	....	....	....	....	....	....	....	....	....
11	....	3.26	3.66	4.1	4.48	4.88	5.3	5.7	6.11	6.52	....	....	....	....	....	....	....	....	....	....	....	....	....	....
12	....	....	4.0	4.44	4.88	5.33	5.77	6.22	6.66	7.11	7.55	....	....	....	....	....	....	....	....	....	....	....	....	....
13	....	....	....	4.81	5.3	5.77	6.26	6.74	7.22	7.70	8.18	....	....	....	....	....	....	....	....	....	....	....	....	....
14	....	....	....	5.18	5.7	6.22	6.74	7.26	7.77	8.30	8.81	9.33	9.85	10.37	....	....	....	....	....	....	....	....	....	....
15	....	....	....	5.55	6.11	6.66	7.22	7.77	8.33	8.88	9.44	10.0	10.55	11.11	11.66	12.22	12.78	13.33	13.88	14.44	15.0	15.55	16.1	16.66
16	....	....	....	....	....	7.11	7.70	8.30	8.88	9.48	10.07	10.66	11.3	11.85	12.44	13.03	13.63	14.22	14.81	15.74	16.45	16.60	17.18	17.77
17	....	....	....	....	....	7.55	8.18	8.81	9.44	10.07	10.70	11.33	11.96	12.59	13.22	13.85	14.48	15.11	15.74	16.37	17.0	17.63	18.26	18.88
18	....	....	....	....	....	8.0	8.66	9.33	10.0	10.66	11.33	12.0	12.66	13.33	14.37	14.66	15.33	16.0	16.66	17.33	18.0	18.52	19.33	20.0
19	....	....	....	....	....	....	9.15	9.85	10.55	11.3	11.96	12.66	13.37	14.07	14.77	15.43	16.18	16.88	17.60	18.30	19.0	19.70	20.40	21.11
20	....	....	....	....	....	....	9.63	10.37	11.11	11.85	12.59	13.33	14.07	14.81	15.55	16.30	17.03	17.77	18.51	19.26	20.0	20.74	21.48	22.22
21	....	....	....	....	....	....	....	....	11.66	12.44	13.22	14.37	14.77	15.55	16.33	17.11	17.88	18.66	19.44	20.22	21.0	21.77	22.55	23.33
22	....	....	....	....	....	....	....	....	12.22	13.03	13.85	14.66	15.48	16.30	17.11	17.92	18.74	19.55	20.4	21.18	22.0	22.83	23.63	24.44
23	....	....	....	....	....	....	....	....	12.78	13.63	14.48	15.33	16.18	17.03	17.88	18.74	19.59	20.44	21.39	22.14	23.0	23.85	24.7	25.55
24	....	....	....	....	....	....	....	....	13.33	14.22	15.11	16.0	16.88	17.77	18.66	19.55	20.44	21.33	22.22	23.11	24.0	24.88	25.77	26.66
25	....	....	....	....	....	....	....	....	13.88	14.81	15.74	16.66	17.60	18.51	19.44	20.4	21.39	22.22	23.14	24.07	25.0	25.92	26.88	27.77
26	....	....	....	....	....	....	....	....	14.44	15.74	16.37	17.33	18.30	19.26	20.22	21.18	22.14	23.11	24.07	24.66	26.0	26.96	27.92	28.88
27	....	....	....	....	....	....	....	....	15.0	16.00	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.0
28	....	....	....	....	....	....	....	....	15.55	16.60	17.63	18.52	19.70	20.74	21.77	22.83	23.85	24.88	25.92	26.96	28.0	29.03	30.81	31.11
29	....	....	....	....	....	....	....	....	16.1	17.18	18.26	19.33	20.40	21.48	22.55	23.63	24.7	25.77	26.88	27.92	29.0	30.07	31.14	32.22
30	....	....	....	....	....	....	....	....	16.66	17.77	18.88	20.0	21.11	22.22	23.33	24.44	25.55	26.66	27.77	28.88	30.0	31.11	32.22	33.33
31	....	....	....	....	....	....	....	....	....	....	....	....	....	....	23.74	25.26	26.4	27.55	28.7	29.85	31.0	32.14	33.29	34.44
32	....	....	....	....	....	....	....	....	....	....	....	....	....	....	24.88	26.74	27.59	28.44	29.63	30.81	32.0	33.18	34.37	35.55
33	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	28.26	29.33	30.55	31.77	33.0	34.22	35.44	36.66
34	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	31.48	32.74	34.0	35.25	36.51	37.77
35	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	32.4	33.7	35.0	36.29	37.59	38.88

TO CONVERT TO TONS { For Limestone, multiply by 2.27. For Trap Rock, multiply by 2.52. For Granite, multiply by 2.3.
For Shale, multiply by 2.18. For Sandstone, multiply by 1.55.

will not be called upon to do more work or break more tons of stone or material than has been previously found economical per pound of explosives. Each drill hole should be located accurately with reference to irregularities of the face, tight and loose spots, seams, etc. The driller should be told the exact depth in feet and inches that the particular hole, which should be numbered for reference, is to be drilled. It is the best practice always to drill each hole from 2 to 3 feet below the grade of the quarry floor. If the burden or distance back from the face to the drill hole is known and the distance between centers of drill holes, it is a simple matter, by using the following table, to check the number of cubic yards of stone or ground to be displaced by each foot of drill hole. The table was published by one of the manufacturers of explosives and is reliable.

Having found from the table the number of cubic yards one foot in length of drill or bore hole will displace for given spacing, multiply the displacement per foot by the depth of the bore hole which gives the cubic yards of ground to be shot or displaced by the particular hole. This result, which is in cubic yards, is converted into tons by multiplying by 2.27 for limestone, 1.55 for sandstone, or by amounts stated at end of table depending on material being handled. Each hole should be calculated by this method separately, and then by adding the tonnages together the total tons in the shot are obtained. From these figures the total pounds of explosives required for the entire shooting operation can be ascertained. This table has been used by the writer and is fairly accurate and useful. It is good practice to allow someone to check all calculations to avoid errors.

Every large shot should be accurately figured, surveyed and laid out on paper; and as explosive effectiveness is directly dependent upon the placement of drill or bore holes, a comprehensive, well defined method of procedure should be outlined before drilling operations are commenced. The measurements and information required are not in any way complicated. The height of bank, depth of drill hole, amount of burden and the amount of toes should be figured as accurately as possible. The accompanying sketch gives an



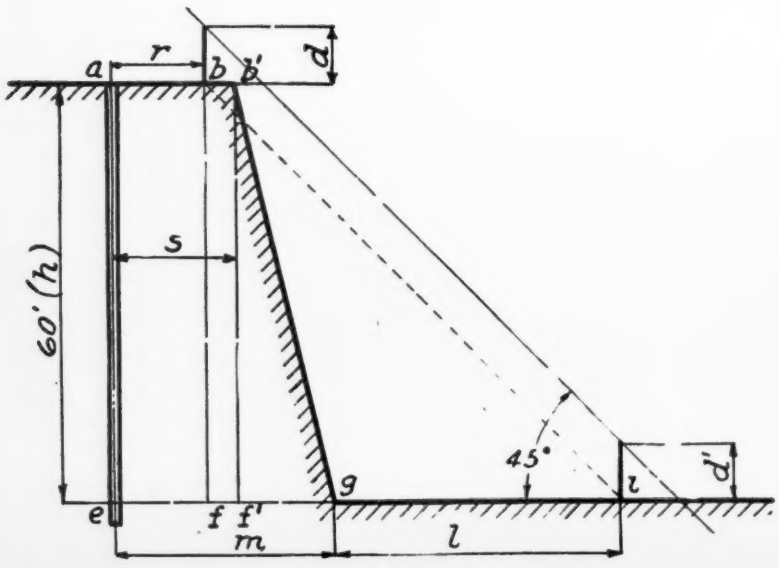
TYPICAL CROSS SECTION OF A BANK

Suggested Spacing of Well-Drill Holes on Faces of Different Heights in Various Kinds of Material

Kind of Material		Granite Gneiss Quartzite	Hard Solid and Thickly Bedded Lime stone and Dolomite	Medium Thickly Stratified Limestone	Thinly Laminated Limestone	Sandstone	Shale Medium Hard to Soft
Spacing	15	7x8	8x9	9x10	10x12	9x10	10x12
in	20	9x11	10x12	10x12	12x14	10x12	12x15
Feet	25	10x12	10x12	12x14	12x14	12x14	15x18
for	30	12x14	12x15	12x15	12x16	13x15	15x18
Given	35	12x14	12x15	14x16	12x16	14x17	16x18
Depth	40	12x14	12x16	14x18	14x18	14x18	17x21
of	45	13x15	12x16	14x19	14x20	15x18	18x22
Cut	50	14x15	14x17	14x20	14x20	15x20	19x24
Feet	55	14x16	14x18	15x21	15x22	16x20	19x24
	60	14x16	15x20	15x22	16x25	16x22	20x26
	70	15x18	16x20	16x23	16x26	20x24	22x27
	80	16x20	18x22	16x25	18x28	18x25	20x28
	90	16x21	18x22	18x26	18x29	18x25	20x29
	100	16x22	18x24	20x28	20x30	20x30	20x30
	120	16x25	20x25	20x29	20x30	20x30	20x32

idea of the measurements required. The following table, which is in common use, is a fair guide in checking spacings for well drill holes. It should be used merely as a check, as by far too many factors must be considered to lay down any hard and fast rule for such an important operation.

There is still another method of calculating the burden imposed on well drill or bore holes and is best illustrated in the following diagram. The height of the bank can usually be ascertained by throwing over a line, and the distance between holes is readily found with a tape. The distance d is the height of the observer's eye from the ground; r is the distance from the hole to the point at which the observer stands when taking measurements. With a hand level set at 45 degrees, a sight is taken down to the quarry floor to a rod on which a point has been marked a distance



from the ground, d equal to d'. A stake is dropped on the quarry floor at the point determined by this 45 degree line. The distance from the stake to the toe is measured with a tape. It is shown in the diagram as l.

In the right triangle bfi, with its hypotenuse at 45 degrees, the leg of bf is equal to fi. The burden on the toe of the hole, m, equals fi+ef—l. But fi=fb=h, and ef=r. Therefore m=h+r—l.

As an example of how to calculate the proper explosive charge, let us assume a problem where h, the height of the bank, is 60 feet; r, the distance of the observer from the hole, is 12 feet; s, the distance from the top of the hole to the rim, is 18 feet; and l, the distance from the rod to the toe of the quarry, is 40 feet. Also assume that the distance of this hole from the adjoining holes on either side of it is 15 feet; that the rock weighs 160 pounds per cubic foot; and that one pound of explosive should be figured on each 4 tons of rock.

From the formula developed above, m, the burden on the hole at the toe, equals h+r—l, or 60+12—40, which is 32 feet. The area ab'ef' equals 18x60=1080 square feet. Area b'f'g equals $(32-18)\div 2\times 60=420$ square feet. The total area ab'ge equals 420+1080=1500 square feet. This multiplied by 15 feet, the linear distance along the face that this hole should break, equals a total burden on the hole of 22,500 cubic feet. This multiplied by 160 equals 3,600,000 pounds or 1800 tons of rock.

Chain Belt Company Opens New Sales Office

The Chain Belt Company of Milwaukee has announced the opening of a sales office at Minneapolis to be in charge of Fred S. Van Bergen. The office is located at 614 Builders Exchange Building. This office will handle all of the Chain Belt Company's chain and engineering lines, marketed under the trade name "Rex", including all types of transmission and conveying chains, sprocket wheels, elevator buckets, transmission machinery, and elevating and conveying machinery.

Foote Bros. Gear & Machine Co., announce that they have recently completed arrangements with the McBurney Stoker & Equipment Co., 619 Trust Co. of Georgia Bldg. to represent the IXL line of Speed Reducers and General Gear Products in the State of Georgia.

The Result of an Excellent Shot—Photo Taken in St. Mary's Cement Company's Quarry at St. Mary's, Canada

(*Continued from page 70*)

inch reversible conveying belt for loading. Cars were loaded from one end and trucks from the other end. Some producers have considered this operation successful. For a while the General Concrete Products Corporation thought that it was. It was, however, very expensive in electric and man power. You wonder why it was done this way? So do we.

The entire plant, except the loading tunnel, was dicontinued this season. An entirely new plant was erected on the north side of the river. The material is now dug from the river and brought directly into the washing plant and is loaded directly into cars under the bins by gravity. Trucks are also loaded from the bins. The tunnel conveyor is used in loading the tunnel bins with surplus stock. With this arrangement 300 cubic yards are produced daily. It is a very much more economical layout and affords greater opportunity for increasing production.

The plant is located two miles from Warren, at Star Brick, Pennsylvania, on the Pennsylvania railroad. A Sauerman cableway with a ¾-yard Crescent bucket is operated by a Thomas two speed hoist. The screens and washing plant are Telsmith equipment manufactured by the Smith Engineering Works. The conveyors also were supplied by the Smith Engineering Works. A Universal crusher does all the crushing. Ardmor motors are used in the plant. The mast for the cableway is one hundred feet high.

The officers of the General Concrete Products Corporation are F. J. Haggerty, President; Walter Beaty, Vice President; F. W. Chaffee, General Manager and Secretary; and H. W. Baker, Treasurer. These officers and C. S. Knabb comprise the board of directors.

Mining Rescue Car in Toledo

Ohio's mine rescue car "Black Diamond," is in Toledo for a brief visit. This marks the first time in history that it has been in regions other than the coal mining counties. It was shunted to a spur in the Wheeling & Lake Erie railroad yards after having been brought from Port Clinton, where it spent the week and was later transferred to Genoa. Nearly 500 employes of the United States Gypsum Company's plant at Genoa will receive training in first-aid practices, to be taught by instructors from the mine rescue car. A class of 65 recently graduated at Port Clinton after having been trained there and at the Gypsum plant.

Under the auspices of the state department of industrial relations, miners and mill workers are being given first-aid training throughout Ohio. Certificates of competency are granted those who take first-aid training and pass examinations conducted by the state instructors. During two months more than 600 such certificates have been granted. The government mine rescue car probably will be in Toledo sometime this month, following upon the course of the state crew and checking its work.

The New Plant With the New Mast Going Up

Factors Governing Modern Lime Kiln Capacity and Fuel Economy

By Victor J. Azbe, Consulting Combustion Engineer*

Part II

PART I of this paper appeared in the June first number of Pit and Quarry. Actual fuel lime ratios, heat distribution in theoretical kilns and kiln efficiency rating were discussed in Part I.

This paper was prepared by Mr. Azbe for the Seventh Annual Convention of the National Lime Association held at Briarcliff Manor, New York, May 26, 27, 28, 29, 1925. It will be published complete in six parts in consecutive numbers of Pit and Quarry.

Editor.

Effects of Excess Air on Lime Kiln Efficiency

Excess air used in combustion of fuel is far more serious in lime kiln than in boiler practice. The reason for this is the difference in temperatures of evaporation of water and the temperature of decomposition of limestone. At 135 pounds, gauge pressure steam is generated at 350 degrees Fahrenheit, while the decomposition temperature of limestone is generally accepted to be 1650 degrees Fahrenheit. If in boiler passes temperature drops to below 360 degrees, no steam will be made, and in the lime kiln no lime will be made if temperature drops below 1650 degrees Fahrenheit.

The above and also the following contentions are somewhat modified by the fact that the outer layers of limestone decompose at lower temperatures than 1650 degrees, but most of it evidently must be decomposed at 1650 degrees, so this figure will be taken as correct in this case.

It is possible to operate a lime kiln so that the stone charge throughout the kiln will be red hot without a particle of lime being made. This occurs when more than 120 per cent of air is used for burning the fuel. The excess air dilutes the gases to such an extent that the temperature is lower than that necessary for decomposition of limestone. Consequently the amount of heat abstracted from the hot gas is much less causing the temperature at the outlet of the kiln to rise.

For every pound of limestone burned, a definite amount of heat is necessary to preheat the stone. Heat of decomposition is 1378 B. T. U. per pound of lime, and heat necessary for preheating is about 619 B. T. U. The heat below 1650 degrees Fahrenheit can, in the main, be used for preheating of stone, and the amount that is not used in this way is mostly wasted.

As the excess air used for the burning of the fuel increases, waste gas temperature also increases until finally a point is reached where the kiln charge takes on no heat, the only heat disposed being by radiation.

Figure I is a theoretical exposition of the principle discussed. It will be noted that, provided there is no loss due to incomplete combustion, carbon in ash, or radiation and if the gas flows properly through the kiln, at zero oxygen, that is, no excess air point, six tons of lime will be made per ton of 12,500 B.T.U. coal. Under these conditions 66.5 per cent of the heat will be used to decompose limestone, 19.5 per cent to preheat limestone, and only 14 per cent will be waste. If, on the other hand, the kiln is operated with an amount of excess air represented by 8 per cent oxygen, the ratio of lime to coal will be as four to one; 44.2 per cent of the heat will be used for decomposition purposes, 19.8 per cent for preheating and 36 per cent will be wasted.

It appears as if the amount of heat necessary for preheating of stone is very little. This is so because the heat used to preheat the CO_2 portion of the $CaCO_3$ becomes again available for preheating stone so only that portion used for preheating CaO of $CaCO_3$ can be considered in this case.

While the theoretical waste gas temperature at six to one will be about 850 degrees Fahrenheit, at four to one it will be 1350 degrees, and it will continue to climb until 1650 degrees is

*A paper prepared for the Seventh Annual Convention of the National Lime Association held at Briarcliff Manor, New York, May 26, 27, 28, 29, 1925.

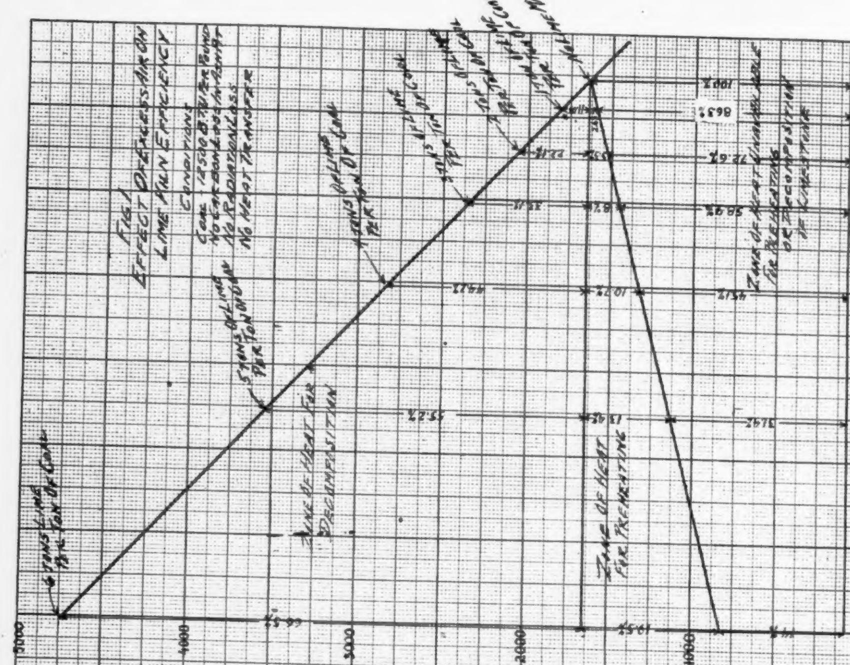


Fig 1
Effect Of Excess Air On Lime Kiln Efficiency
Conditions
No Heat Transfer
Zone Of Heat For Decomposition
Zone Of Heat For Preheating
Relative Heat Head
Oxygen In Waste Gases - Per Cent

Fig 2
Effect Of Excess Air On Lime Kiln Efficiency
Conditions
Zone Of High Temperature Elevation Heat Loss
Zone Of Heat Used For Decomposing Limestone
Neutral Zone
Relative Head (Heat) In Degrees Fahr.
Oxygen In Waste Gas - Per Cent

reached when the loss will be 100 per cent.

In practice, results will be worse, and excess air will have a greater effect upon efficiency for the reason that while limestone is a fairly good conductor of heat, lime, being porous, is a bad conductor and will transfer heat only about one-sixth as well. While limestone is burned, it will become coated on the outside with lime, and as this coating increases in thickness, it becomes increasingly difficult for the heat to penetrate. If the temperature externally of the lime coating were only the 1650 degrees Fahrenheit, there would be no temperature head and it would take a very long time for the heat to penetrate. To increase this transfer a temperature head is maintained which may be as high as 850 degrees Fahrenheit, that is the temperature of the flame would be 2500 degrees Fahrenheit. If the temperature head should drop off to below 100 degrees, very little lime would be made, and as a practical proposition, none, because too long a time would be required to calcine the core, and kiln capacity would not be high enough to be considered practical.

Figure II takes radiation, carbon in ash loss, and temperature head into consideration. As temperature head 150 degrees Fahrenheit was accepted, radiation and carbon in ash loss was assumed at 25 per cent, 17 per cent of this was from the burning zone and 8 per cent from the preheating zone. It will be noted that under these more practical conditions the amount of lime made per ton of coal is much less, being only 4.4 tons per ton of 12,500 B. T. U. coal as compared in the previous theoretical case of 6 tons of lime per ton of coal. It will also be noted that at slightly over 10 per cent oxygen, no lime is made, or, better expressed, it is made at such a slow rate that from a practical angle, kiln capacity is zero.

In case of a boiler when the fire is poor, fuel is wasted, but the fire never gets so bad that furnace temperature is so low that heat would be taken from the steam in the boiler. In lime kilns this occurs frequently. When the kiln is drawn and the fire cleaned, the oxygen usually runs to beyond the 11.5 per cent point. Whenever this occurs, heat is given by the hot limestone to the gas instead of receiving it. The loss due to this may be quite serious, and some of the formed lime may even be recarbonated. Figure II shows the location of this zone of reversed heat flow. It thus becomes apparent that the fuel loss in lime kilns can be not only 100 per cent of the coal fired in a given period, but it can actually be more than this, and it quite frequently is more.

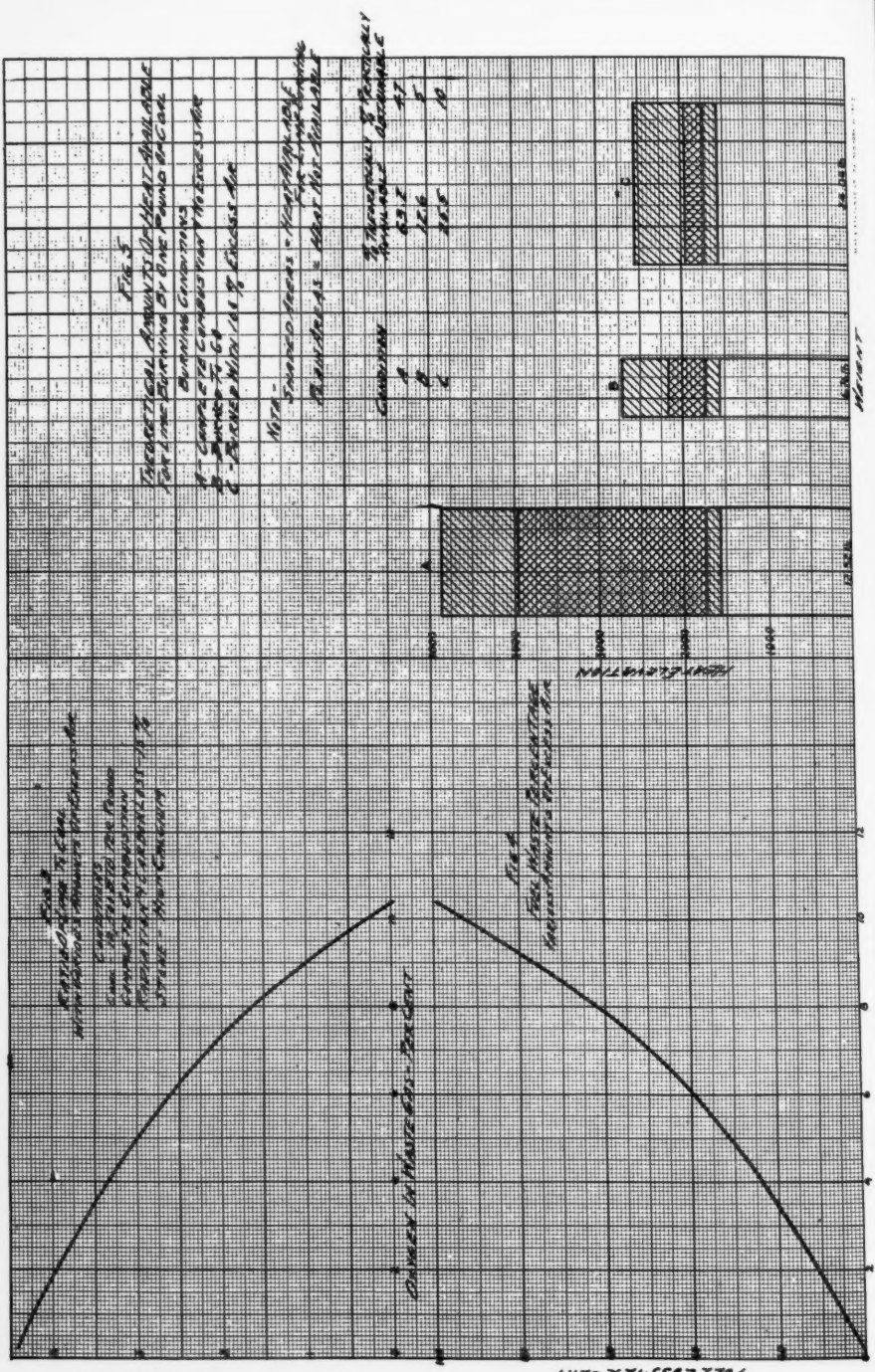
Figure III gives the ratio of lime to coal obtained under conditions outlined and illustrated on Chart II. The chart is based on 12,500 B. T. U. fuel. If heat value is greater or less, the ratio will vary proportionally. If there is incomplete combustion, the results will be poorer than shown.

Figure IV shows the same, only expressed in terms of fuel loss percentage. Even when the kiln is operated with 2 per cent oxygen, fuel loss is 12 per cent. If oxygen is 6 per cent, fuel loss becomes 40 per cent, and thereafter it mounts very rapidly.

Low oxygen means high temperature when mixing is good; so there is a possibility that under the most economical fuel burning conditions the temperature developed will be so great that lime may be overburned. To prevent this without sacrificing fuel economy, kiln furnaces and kiln firing should be such that most of combustion will take place in the kiln in contact with the rock or lime extracting the heat. Fortunately, low oxygen means retarded combustion, so heat will be extracted almost as fast as it is formed and temperatures will not get too high.

Infrequent firing is the greatest factor conducive to fuel loss. There is incomplete combustion at first; then the fire burns down and there is an excess of air which rapidly increases. During drawing of kilns especially, the excess air often goes so high that oxygen percentage ranges around 15 per cent. While usually there is very little fuel burned at such a time, heat is wasted because of reverse flow, that is, flow from lime to gas.

The contentions made in this chapter may not be fully correct under all conditions. The point of zero production may be at a higher or lower oxygen content; the actual point will be determined by possible lower or higher temperature head, or different decomposition temperature or different radiation loss. But in spite of this, there is no doubt that too large amounts of excess air used for burning of fuel are responsible to a great



extent for inefficiency of lime kilns. Keep the oxygen percentage down as low as possible without causing too great loss due to imcomplete combustion. Keep it as constant as possible and keep it also down when drawing kiln or cleaning fires.

Incomplete Combustion

When carbon is burned to carbon dioxide, the resulting weight of gas is 1252 pounds, and its theoretical temperature is around 4800 degrees Fahrenheit of which all above about 1600 degrees is available for lime making. Figure V shows in diagram A this condition. Horizontal extension means weight of gas, while vertical extension represents temperature elevation possible if all heat in carbon were developed before any could be taken away. The area represents heat. The shaded area represents heat available for lime burning; the darkly shaded area represents that used for lime making in a plant where radiation loss is not very great and the kiln is so designed that not a very great temperature head is required in the decomposition zone. When carbon is burned to carbon dioxide, about 47 per cent of the heat in the fuel is utilized by a good kiln. If the same kiln burned carbon with 100 per cent excess air, the same amount of heat would be developed; but this heat would be distributed over a greater weight as shown by diagram C, and only about 10 per cent would be used for lime burning. The reason for this has been explained above.

If, however, one pound of carbon is burned to carbon monoxide, not only the potential temperature elevation will not be required, but also the weight of the products of combustion will be less than in the case of ideal combustion. With incomplete combustion, in diagram B, the darkly shaded area becomes insignifiicantly small when compared with A. Only about 5 per cent of heat is used for lime making; almost all is wasted. Figure 6 shows better the effect of burning coal with either too much or too little air. The point of best results is very sharp. Any deviation from this point is heavily penalized. In addition when the kiln is operated with insufficient air, the lime will look darker than when the CO is absent.

When carbon monoxide is found in kiln gases, it is more than likely that other combustible gases are also present, such as methane and hydrogen. Most of the incomplete combustion is due to the volatile matter in the coal and irregular combustible gas evolution. The Bureau of Mines' contention is that air passing through incandescent fuel bed 3 inches thick is fully satisfied with carbon. If no air is admitted above the fuel bed and thickness is greater, incomplete combustion will be the result. In ordinary practice additional air always enters the furnace around the firing door and through thin burned-out spots in the fuel bed. Generally, this air is sufficient and quite often more than sufficient. Under certain conditions, however, it becomes insufficient. A hand fired grate will pass a much greater amount of air immediately after it has been cleaned, when there is no ash accumulation on the grate, and the fuel bed is thin, than after a time when there is ash and clinker accumulation to obstruct the air passage. As a result, after a time there may be incomplete combustion due to insufficient air. A hand fired grate also works on two different principles; that of a gas producer, and that of a gas retort. Immediately after the coal is thrown on the grate, both principles are active; the carbon on the grate being driven off according to the gas producer principle, and the volatile matter, according to the gas retort principle.

From the above the conclusion will be reached that if there is insufficient air and consequent incomplete combustion immediately before putting fresh charge of coal on the fire, the incomplete combustion will be much worse after the coal is put on and gas is being driven off which cannot find air to burn and in consequence escapes unburned. Under these extreme conditions all of the gas in the volatile matter which may contain 35 per cent of the total heat in the coal will escape unburned. However, it is not often that conditions are such that almost all of the combustible gas from the volatile matter escapes unburned. As a rule it will be found that right before firing too much air is used and right after firing too little is used. Since one is as bad as the other, a heat loss of 35 per cent of the fuel due to irregular evolution of heat and inproportionate air supply is common.

The volatile matter after being evolved from the coal consists mostly of hydrogen and methane and to a certain small extent carbon monoxide, or roughly in about the following proportions:

	Approximate Combustion by Volume	Approximate Relative Heat Content
Methane CH_4	28.15	61%
Hydrogen H	53	34%
Carbon Monoxide CO	6	5%

Methane is the most valuable from the lime kiln standpoint. Burned under proper conditions it will give a long, mild, luminous flame, very effective for lime burning, easy on the kiln refractory, and of high radial heat capacity. With insufficient air, methane will, however, break down into hydrogen and soot.

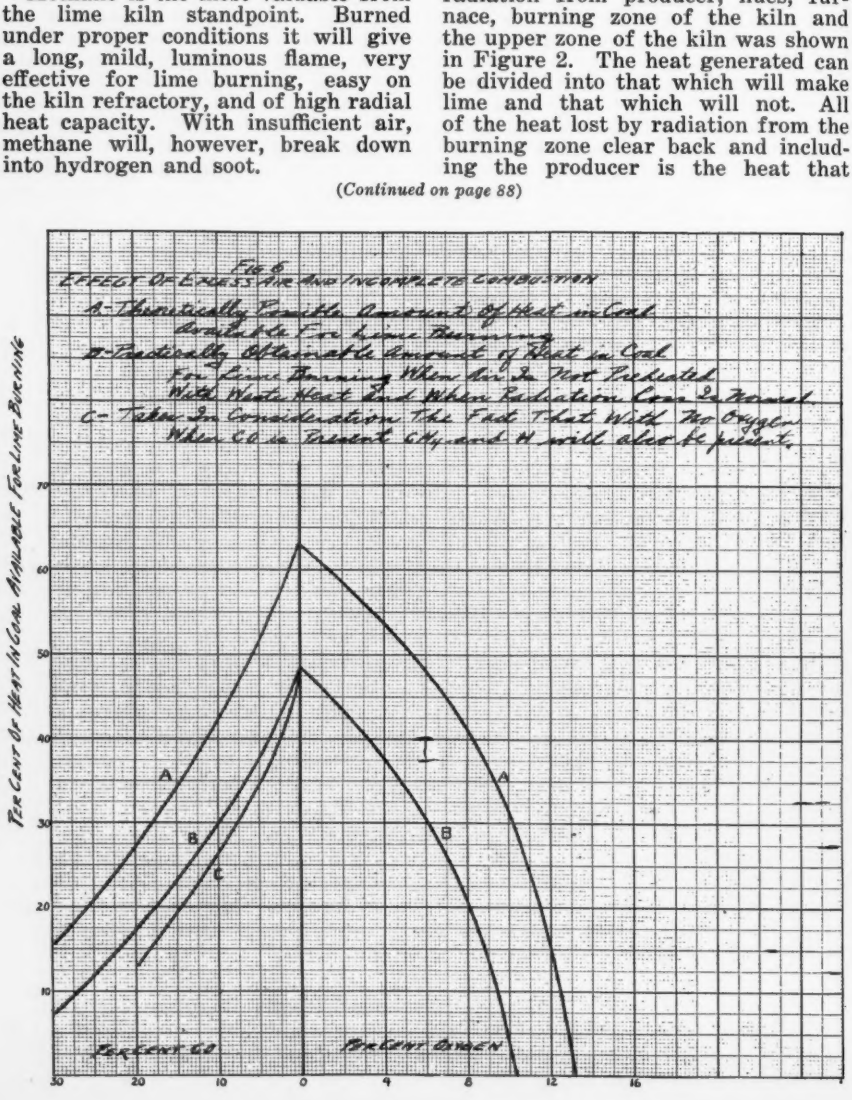
$=CO_2—2H2O$, with the resulting dense smoke.

Steady evolution of combustible gases from the coal with proportionately constant supply of air is one of the most important problems the lime man has to solve if he wants high efficiency. The gas producer solves it, but it has other drawbacks that can seriously harm and which will be discussed later.

Heat Loss by Radiation.

The serious effect of heat loss by radiation from producer, flues, furnace, burning zone of the kiln and the upper zone of the kiln was shown in Figure 2. The heat generated can be divided into that which will make lime and that which will not. All of the heat lost by radiation from the burning zone clear back and including the producer is the heat that

(*Continued on page 88*)

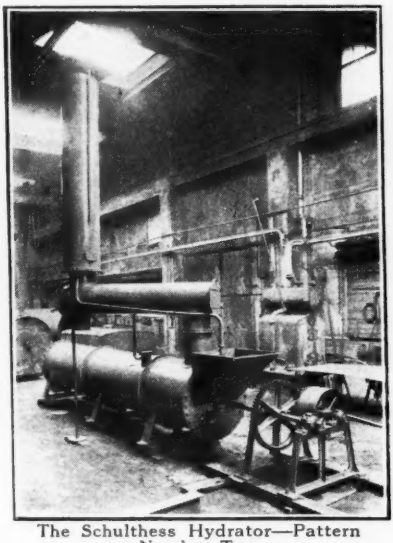


The Schulthess Hydrator

SCHULTHESS patented hydrators are designed for all size hydrating plants. There are six standard sizes, varying in capacity from one-half to five tons per hour. The hydrator is simple in construction. All parts are amply strong to perform the work intended. It produces a uniform high grade hydrate with a low operating and maintenance cost.

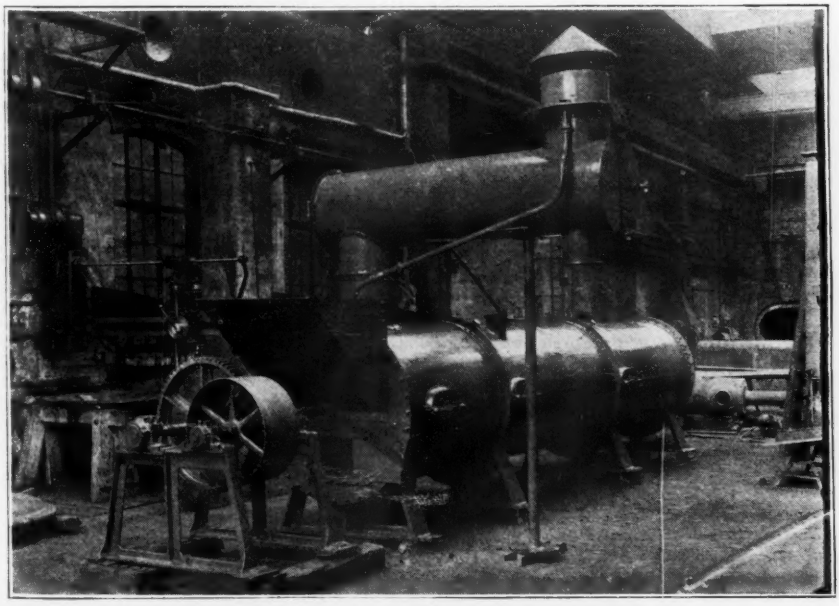
The Schulthess hydrator consists of a long plate steel cylinder mounted on heavy steel bases. In the center of the hydrator there is a steel shaft to which are fastened steel mixing and transporting blades. A countershaft is provided with the necessary tight and loose pulleys and a pair of spur gears to connect the countershaft to the hydrator shaft. The necessary bearings and stands are furnished for the main shaft and also for the countershaft.

The feed end of the hydrator is provided with a plate steel hopper, from which the lime is fed into the coarse mesh sieve, or slaking cylinder, and this sieve is mounted on the hydrator shaft. The lime from the slaking cylinder is discharged into the hydrator and the dry hydrated lime leaves the remote end of the hydrator through the discharge chute.



The Schulthess Hydrator—Pattern Number Two

The burnt lime, as it comes from the kilns, is fed into the plate steel feed hopper without any previous



Schulthess Hydrator Pattern Number Three

breaking up being necessary. The sieve, or slaking cylinder, is open at the hopper end and is fitted with a sprinkler pipe along the top.

The shaft is set in motion by means of the pulley drive and the necessary quantity of slaking water is introduced at the same time through the sprinkler pipe. Under the influence of the heat and steam generated the crude lime is reduced to lime powder or small pieces. The material falls through the sieve into the main body of the hydrator only after sufficient slaking, and the consequent reduction in size has taken place.

The partially slaked lime in the hydrator is then thoroughly mixed and broken down mechanically, being also subjected to the beneficial effects of the intense heat and steam produced.

As the lime is being slowly propelled along the hydrator it is completely slaked and transformed into a very fine, calcium hydrate powder, and ultimately leaves the hydrator in an absolutely dry state and relatively pure.

It will be seen that each individual lump of lime receives a preliminary slaking in the revolving sieve, and the production of pure, dry hydrated lime is thereby accelerated to a remarkable degree. Foreign matter, such as unburnt limestone, coke, slag, clinkers, etc., is largely retained in the revolving sieve and assists in the process of breaking down the lime. Any particles which pass the sieve can be removed by air separation or by merely sifting the powder, which is quite dry as it leaves the machine, and thus a pure calcium hydrate is obtained.

The McGann Manufacturing Company have the sole right for the manufacture and sale of the Schulthess hydrator in the United States, Canada, Cuba, Porto Rico and South America.

"Clean Water" Intake Screens

A new Link-Belt Book descriptive of "Clean Water" Intake Screens has just been published.

The forepart of the book is given over to a brief description of the general construction of the Link-Belt Screens, and followed with more than thirty elaborate views of various installations.

A Low Pressure Combination Cutting and Welding Torch

A low pressure torch which will operate on either low pressure or high pressure gas with equal efficiency is being marketed by The Alexander Milburn Company of Baltimore, Maryland. It is especially constructed to operate with low pressure acetylene gas, city gas or hydrogen. It is excellent for use with a low pressure acetylene generator.

This torch is very efficient and utilizes the highly specialized and standardized parts of the Milburn cutting and welding torches. It insures a correct and intimate mixture of the oxygen and acetylene resulting in "super mixing" and non-flashback qualities. It is adapted to perform welding as well as cutting work by the mere interchange of tips. It performs practically all the cutting and welding operations within range of the process with highest efficiency and economy.

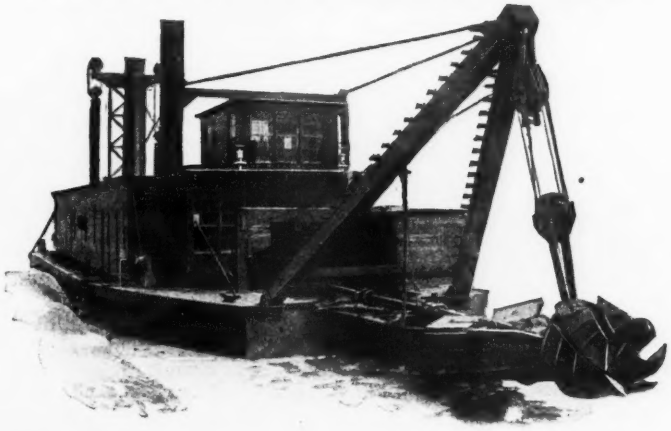
The torch is of bronze forgings and special seamless tubing, constructed to withstand constant service. The tips are made of solid copper and are interchangeable with a large number of low pressure torches of other makes. This torch carries with it the same guarantee as the Company's Standard Milburn Apparatus.

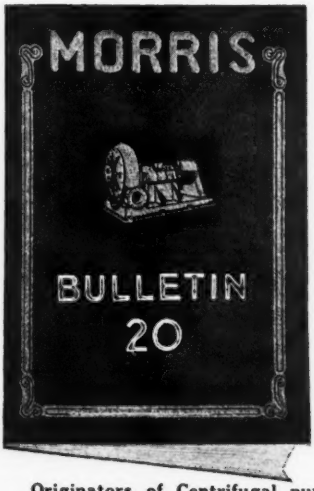
The Alexander Milburn Company has just issued two miniature catalogs, one descriptive of portable carbide lights for night operation and the other of Milburn welding and cutting apparatus from a small torch to a large compressing plant.

New Speeder Distribution

The Speeder Machinery Corporation, Fairfield, Ia., manufacturers of ½ yard full circle swing shovels and cranes, announces the appointment of four new agencies. The I. E. Shilling Co., 125 N. E. 6th St., Miami, Fla., will handle their account in Florida; G. C. Kenney, 410 New York Life Bldg., Kansas City, Mo., in Missouri, Kansas and Oklahoma; L. Z. Howell, 37 W. Van Buren St., Chicago, in the State of Illinois; and the Boehck Machinery Co., 2404 Clybourn, Milwaukee, Wis., in the State of Wisconsin and part of Michigan.

HYDRAULIC DREDGES





We furnish either the fully equipped dredge ready for operation, or merely the machinery with plans from which the purchaser can build the hull and make the necessary installations.

The Morris line also includes centrifugal pumps of all desirable sizes and construction for material conveying and pressure boosting.

Write for Bulletin 20

Morris Machine Works

Baldwinsville, N. Y.

Originators of Centrifugal pumps, both single and multi-stage, and builders for practically all purposes since 1864

Branch Offices: New York, 39-41 Cortlandt St.; Philadelphia, Forest Bldg.; Cleveland, Engineers' Bldg.; Chicago, 217 N. Jefferson St.; Boston, 79 Milk St.; Pittsburgh, 320 Second Ave., Detroit, Penobscot Bldg.; Charlotte, Realty Bldg.; Richmond, 708 Mutual Bldg.

Sales Representatives: Buffalo, St. Paul, Kansas City, Denver, Salt Lake City, Seattle, Portland, Ore., Los Angeles, New Orleans.

MORRIS
CENTRIFUGAL PUMPS

Continued from page 84

would all have been available for decomposing $CaCO_3$ or $MgCO_3$. If the heat lost were estimated, the resulting figure divided by 1378 would give us the loss in pounds in case of CaO and divided by 977 in case of MgO.

The actual loss of heat is more than the heat lost by radiation because, to make up for loss of heat of high temperature elevation, the corresponding amount of heat of low temperature elevation cannot be utilized, and to make up for it additional coal has to be burned. Part of the heat thus developed becomes available, and part is lost. Consequently, the loss for every B.T.U. of heat radiated from a gas flue or furnace is actually two B.T.U., one radiated and one wasted on top of the kiln.

Since heat means gas volume and since kiln capacity for moving gas is limited, it becomes apparent that loss by radiation reduces kiln capacity with the same amount of draft available. That is, it reduces the capacity more than would be apparent from the amount of heat loss. All of this makes it imperative that the lime plant be so designed that the heat loss by radiation will be at a minimum, either by having little radiating surface exposed or by having it thoroughly insulated. This applies to zones containing heat of high temperature elevation; the insulation of the preheating zone is of no importance since there is more heat available for preheating than is required.

Let us assume a gas flue from producer to the kilns 4 feet in diameter and 100 feet long, lined only with 4½ inches of brick and containing gas at an average temperature of 1000 degrees Fahrenheit. The heat loss by radiation will be 1,000 B.T.U. per square foot per hour; the total surface will be 1255 square feet. So the loss of heat radiated will be 1,255,000 B.T.U. per hour. Since an equivalent amount of heat is wasted on top of the kiln, the loss will be twice this, or 2,510,000 B.T.U., which in a day's time amounts to 2.4 tons of coal, and in addition a loss of 11 tons of lime directly and a certain amount indirectly due to crowding of the kiln with ineffective gas. If this same flue in addition had 4½ inches of effective insulation, the loss would be only about one fourth of that estimated above.

New Incorporations

Howes Sand Company, Inc., Springfield, Mass., stone, gravel and sand; capital $100,000; incorporators, Leroy P. Howes, Edwin R. Peckman and Genevieve A. Hamilton, all of Springfield.

The Sciotoville Sand and Gravel Company, Portsmouth, Ohio, capital $15,000. G. S. Monroe, Chas. I. King, H. O. Lindsey, Geo. W. Watkins and F. C. Fuller, incorporators.

Midway Sand & Gravel Company, Parkersburg, W. Va., will develop and mine several gravel tracts in Wood County, and in Washington County, Ohio. Capital stock, $60,000; incorporators: J. L. Williams, L. H. Mallory, J. S. Echols, E. W. Mallory and S. T. Echols.

Sickler Quarries, Inc., Alford, Pa., capital $10,000; incorporator A. J. Masters, Kingsley, Pa.

The Frechette and Clanders Granite Co., Inc., of Concord, Vt., capital $50,000. Incorporators: A. G. Frechette and F. B. Flanders of Barton, Richard Hurst, F. R. Sherman and J. F. McCarten of Newport, John Moyse of Concord and W. W. Reirden of Barton.

Concrete Gravel Company, Columbus, Lowndes County, Miss., capital $30,000; T. W. Townsend, Ira L. Gaston and others, incorporators.

H. D. Bahr Sand & Gravel Corp., New York City; capital $25,000; H. D. and E. H. Bahr, F. C. Hirleman, incorporators. (Attorneys Hirleman & Vaughan, 391 East 149th Street.)

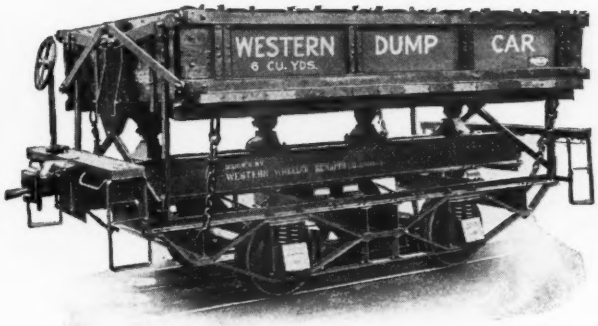
Falls Sand and Gravel Company, Scranton, Pa., capital $40,000. G. A. Bender, 932 Sunset Street, incorporator.

United Silica Sand Company, capital $500,000. John T. Coonan, H. L. Jennings, M. B. Paxson, Buffalo, New York, incorporators.

Rex Concrete Mixers and Pavers will continue to be stocked and distributed by the Wm. H. Ziegler Company of Minneapolis, who have been the exclusive mixer representatives of the Chain Belt Company for the last three or four years.

The Webster Manufacturing Company announces the appointment of Mr. L. A. Scheck as manager of the Boston Sales office, at 902 Oliver Building.

Greater Production and Lower Costs



Western 6-yard Standard Gauge Dump Car.
This is the favorite car for pit and quarry work.

WE should like to look over your plant haulage system with a view to increasing your production and reducing your cost unit. Often inferior or make-shift dump cars are used with the mistaken idea of economy, whereas such cars are a costly extravagance, limiting the production of both shovel and crusher. A track layout often can be so improved that time now lost will be made productive.

Write to-day. We will help if we can.

WESTERN WHEELED SCRAPER COMPANY
Founded 1877

Western

Earth and Stone Handling Equipment
AURORA, ILLINOIS

"WE BUY—SELL or RENT"

BUCKETS

78—Clamshell Buckets: 3—2-yd.; 2—1½-yd.; 23—1-yd.; 48—¾-yd.; 5—½-yd.; consisting of Standard, Blaw-Knox, Hayward, Owens, Lakewood, McMyler, O. & S. and Peerless.
5—Hayward Orange Peel Buckets: 1—¾-yd.; 1—1-yd.; 1—1½-yd.; 2—15 cu. ft.

CRANES

1—15-ton O & S, 8-wheel M. C. B., 40-ft. boom, bucket operating.
1—Brownhoist Combination Crane and Dragline, 40-ft. boom, ¾-yd. bucket, caterpillar, steam.
1—O & S 7-ton Crane, 30-ft. boom, ¾-yd. clamshell bucket, traction wheels.
1—Byers Auto Crane, 30-ft. boom, ¾-yd. bucket, traction wheels, steam.

STEAM SHOVELS

2—78-C Bucyrus late 1923 model 30-ft. boom, 19-ft. stick, 3-yd. dip. 1 on railroad trucks, 1 on caterpillar.
1—50B Bucyrus fully revolving on caterpillars, 26-ft. boom, 17-ft. stick, 1¾-yd. dipper, new November 1923.

LOCOMOTIVES

4—Porter 36-in. ga. 18-ton saddle tank cyls., 10x16, rebuilt like new. Nos. 4619, 4667, 6804, 6805.
1—Davenport std. ga. 20-ton cyls. 10x16 saddle tank. Shop No. 1747.
2—Porter, std. ga. saddle tank cyls. 14x22, weight 42 tons, like new, only 1 year service.

STIFF LEG DERRICKS

Large number of practically new American Hoist & Derrick Co. Stiff Leg Derricks, mast 16x16x40-ft., boom 14x14x80-ft., trussed, stiff legs 14x14x55-ft. or 60-ft., bull wheel steel 16-ft. in diameter. We can furnish these either single line or bucket handling, complete with all fittings, or will sell complete set of fittings separate.

GUY DERRICKS

1—Dobbie Steel Guy Derrick, 70-ft. mast, 60-ft. boom, capacity 10 tons.
1—American 16x16x74-ft. boom, 82-ft. mast, (wood), bucket operating.
Also large number of Guy Derricks ranging in size from 12x12x40-ft. boom to 14x14x80-ft. boom, with mast to correspond.

If you don't see listed what you want, write us. We may have it.

Equipment Corporation of America

Philadelphia
660 Land Title Bldg.
Phone Rittenhouse 5498

CHICAGO, ILL.
1460 Roanoke Bldg.
Phone Randolph 6586

Pittsburgh
860 Empire Bldg.
Phone Smithfield 1502

FOR SALE
DUMP CARS—Etc.

22—Standard Gauge 6 yd. capacity 2 way Dump Cars, Rebuilt with New Bodies, etc.

7—Standard Gauge 12 yd., capacity Dump Cars.

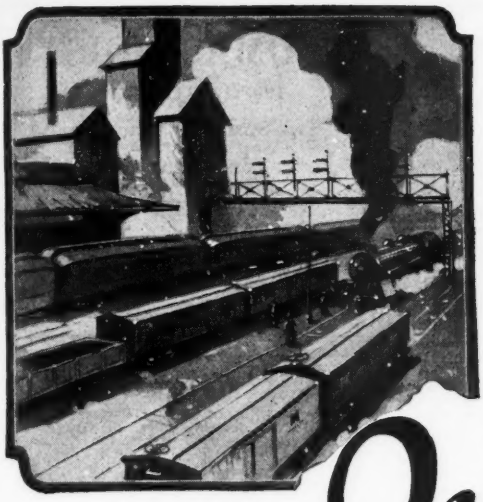
—STEAM SHOVELS—

1—Marion "21" on caterpillars, ¾ yd., with clam-shell and Dragline attachment: Used only 60 days since built, Overhauled.

Locomotives, Narrow and Standard Gauge, etc.

Southern Iron & Equipment Co.
(Est. 1889)

ATLANTA, GA.



HYMAN M MICHAELS

The H-M seal on rails or equipment is your guarantee of highest quality.

Quality

RAILS
of all weights for every purpose

LOCOMOTIVES
Road Switch
Geared
Narrow Gauge

CARS
Ore Box Dump Flat
Gondola Caboose
Refrigerator
Passenger

Hart Convertible
Rodger Ballast

EVERY H-M Rail, Car or Locomotive you order from us has been passed upon by our own expert inspectors. We *guarantee the quality* because we base our judgment on first hand knowledge.

For practically every purpose, we recommend the purchase of good selected H-M relaying rails—as their use means a saving in cost of 30% to 50%.

Complete stocks of both rails and equipment and facilities for handling are maintained at each of our 4 great yards. This assures a rapidity and accuracy in supplying your requirements that has never been approached elsewhere.

Hyman-Michaels Company

SELECT USED RAILWAY EQUIPMENT

Peoples Gas Building, Chicago

NEW YORK PITTSBURGH ST. LOUIS

Pacific Coast Representative:

United Commercial Co., San Francisco

SEATTLE PORTLAND LOS ANGELES EL PASO

LOCOMOTIVE CRANES

For Sale or Rent

BROWNHOIST No. 9359, 7-ft. gauge, 4-wheel, ASME boiler, double drums, 44′ 6″ boom, complete with 1½ cu. yd. clamshell. Like new. Used less than 6 months.

OHIO 20-ton cap., 50′ boom, double drums, 8-wheel MCB, Massachusetts boiler. One year old. First class condition.

McMYLER 14′ 6″ gauge, steam operated, full revolving, 64 ft. boom, 2½ yd. clamshell bucket.

Philip T.
KING
"The Crane Man"
50 CHURCH ST., NEW YORK CITY

THOMAS HOIST

100 H.P. Electric
Two-Speed for Slackline
Cableway Operation
Entirely Rebuilt by Us

THOMAS ELEVATOR CO.
20 S. Hoyne Ave. Chicago, Ill.

Locomotive Crane

40 TON
A Real Crane at a Bargain
Used Only Short While

READY TO WORK
Write or Wire

ZELNICKER IN ST. LOUIS
Rails, Locomotives, Cars, Frogs, Switches, Etc

CRUSHERS

No. 5 Austin, with screens and elevators.
No. 7 Austin No. 8K Gates, No. 9K Gates.
36x48 Allis Chalmers Jaw, with motor.

BOILERS

2—200 HP Dry Back Scotch Marine type, excellent, 140 lb. steam.
100 HP Loco Fire Box type, 100 lb. steam.

EQUIPMENT

450 ft. Ingersoll Belted Air Compressor.
10 ton Stiff Leg Derrick, 7x10 DD Hoist.
50 and 75 HP FM Type Y Oil Engines.
36 in. gage 1-½ and 4 yd. Dump Cars.
8 ton 36 in. ga Whitcomb Gasoline Locomotive.

VULCAN EQUIPMENT & MCHY. CO.
Railway Exchange Bldg. St. Louis, Mo.

FOR SALE

Stone Crushing Plant complete with steam power plant and all accessories. Consists of No. 3 Gyratory Crusher, 2 prs. 40x16 rolls, 2 prs. 36x16 rolls, 1 pr. 30x20 rolls, 1 pr. 24x15 rolls, 5 Newaygo Screens, 4 Trommel Screens with necessary elevators, transmission, many spare parts, etc. Two 150 H.P. R.T. Boilers, Two 100 H.P. Horizontal Engines, air compressor, lighting plant, pumps, stack, pipe, fittings, pulleys, etc. Two storage tanks and everything to complete a well equipped plant for the manufacture of granules. All machinery in first class condition. Will sell at tremendous sacrifice if taken at once. Make your inspection and make us an offer. Will sell whole or part. Plant located at Maria Furnace near Gettysburg, Pa.

SHELDON SLATE PRODUCTS COMPANY
Granville, New York

REBUILT EQUIPMENT

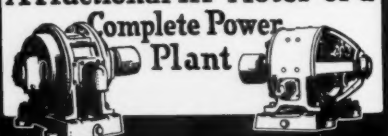
1—No. 4½ Champion Jaw Crusher. Price, $750.00.

1—9x15 Blake Jaw Crusher. Price, $650.00.

1—No. 3 McCully Gyratory Crusher. Price, $750.00.

THE DAY & MADDOCK COMPANY
West 82nd St., South of Denison Ave.
CLEVELAND, OHIO

A Fractional HP Motor or a Complete Power Plant



SAVE 35 to 45%
Buy Properly Rebuilt Electrical Power Equipment
Every machine completely overhauled and tested—Guaranteed
Write for Stock Bulletin
The FUERST-FRIEDMAN Co.
CLEVELAND, OHIO

3—3½ yd. SHOVELS

Railway Type, Mang. Dippers
Crushers, #10, 9, 8, 7½, 6, 5, 4, 3, Roll Crushers
84x72, 36x60, 54x24, 18x30 Jaw Crushers
22x52″, 12x20″, 12x26″, 20x24″, 15x36″
DISC CRUSHERS, 48″, 36″, 24″, 18″
120 H.P. Gasoline Engine
(with Power Take Off)
Kilns, Pulverizers, Elevators
New 78x20 and 78x25 Screens and others.
Ross Power Equipment Co.
13 South Meridian St., Indianapolis, Ind.

NEW and RELAYING RAILS

New and Relaying Rails (all sizes); Spikes, Bolts, Angle Bars; Track Accessories on hand for immediate shipment at all times. Give us a call.

SONKEN-GALAMBA CORPORATION

(Kaw Station) Kansas City, Kans.

MACHINERY FOR SALE

ROTARY CRUSHERS

Three No. 1, Two No. 1½ and One No. 2 Sturtevant Rotary Fine Crushers.

GYRATORY CRUSHERS

Two No. 3 Gates, One No. 4 Gates, Two No. 5 Gates, Two No. 6 Gates & McCully, Two No. 7½ Gates and Austin, Three No. 8 Gates & Traylor, One No. 9 Gates Gyratory Crushers.

JAW CRUSHERS

Three 9"x15", One 10"x20", Two 12"x24", One 15"x30", One 18"x36", One 24"x36", and One 36"x42" Jaw Crushers.

CRUSHING ROLLS

Two 10"x16", Three 10"x30", Two 16"x36", Two 16"x42", and One 24"x54" Crushing Rolls. Swing hammer mills and other types.

DRYERS

Two 3'x20', Three 4'x30', One 5'x25', One 5½'x40', Two 6x60', and One 7'x60' Direct Heat Rotary Dryers. One 5'x25', One 6'x30' Ruggles Coles type "A" and one 4'x20' Ruggles Coles type "B" Double Shell Rotary Dryers.

KILNS

One 4'x40', One 5'x50', Two 6'x60', One 6'x125', One 7'x60', Rotary Kilns.

SWING HAMMER & TUBE MILLS

Fuller, Griffin, Hardinge and Raymond Mills.

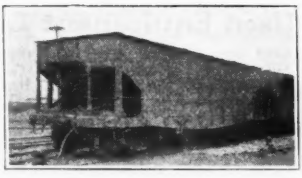
W. P. HEINEKEN, Engineer

95 Liberty St., New York City, Tel., Hanover 2450

FOR SALE

600—50-Ton All Steel Double Hopper Cars.

(400 have rolled steel underframes and 200 have pressed steel underframes)



Complete specifications upon request

BRIGGS & TURIVAS (Inc.)

110 South Dearborn Street, Chicago, Illinois

Railroad Cars and Equipment
Freight Car Parts
Relaying Rails and Fastenings

Scrapped Iron in all its Forms
New Iron and Steel
Industrial Plants and Equipment

CONTRACTORS' EQUIPMENT FOR SALE

The following air compressors are all in first class mechanical condition and guaranteed, being complete with all fittings, same as are furnished on new machines:

1— 396-ft. Class WB-2 Sullivan, 2 stage.
1— 534-ft. X-2 Ingersoll Steam Compressor.
1— 558-ft. Norwalk 2 stage.
1— 558-ft. Class WB-2 Sullivan, 2 stage.
1— 628-ft. Class A Ingersoll-Sergeant.
1— 734-ft. Imperial X-2 Ingersoll-Rand.
1—1056-ft. Imperial X-3 Ingersoll-Rand.
1—2394-ft. Imperial X-3 Corliss Ingersoll-Rand.

The above all designed and built for 100 to 150 lb. steam pressure and to deliver air at 80 to 120 lb.

1—16x16x14 XB-1 Imperial Ingersoll-Rand belt driven compressor, built for 30 lb. terminal air pressure. Capacity 1000 ft.

SAVE MONEY

by buying one of these Machines

1—200-hp. S. Freeman & Son Internal Fired Boiler.

ELECTRIC HOIST

1—Wm. A. Box Iron Works Company Electric Hoister, No. 80-16688. Rope Speed 700 ft., P.M. Pull 5500 lb., double drums 42x29 in. Complete with 112-hp. G.E. motor, 3 ph., 60 cy., 440 v., 690 r.p.m. (This equipment practically new.)

STEAM ENGINES

1—18x36 L. H. Murray Corliss.
1—14x36 R. H. Hamilton Corliss.
1—14x36 L. H. Murray Corliss.

All guaranteed first class

McNEAL MACHINERY COMPANY **Joplin, Missouri**

AIR COMPRESSORS

BELT AND MOTOR DRIVEN

177 ft. Ingersoll, "ER-1."
360 ft. Chicago, "NSB" with motor complete.
528 ft. Ingersoll, "ER-1."
599 ft. Ingersoll, Imperial "XB-2."
1190 ft. Ingersoll, Imperial "XB-2."
1145 ft. Chicago, "OCB."
1500 ft. Ingersoll Imperial "XB-2."

STEAM DRIVEN

360 ft. Chicago, "NSS."
690 ft. Chicago, "GST."
750 ft. Bury, "CPP."
1190 ft. Ingersoll, "X-2."
2300 ft. Ingersoll, "X-3."

Other Types and Sizes.
Send us your inquiries.

PITTSBURGH PNEUMATIC MACHINERY CO.
507 Liberty Ave., PITTSBURGH, PA.

SURPLUS EQUIPMENT

(Buy it right off the job and get it cheap.)

BOATS	DRAGLINES	PIPE
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BATCH BOXES	DRILLS	ROLLERS
BELTING	ENGINES	SCRAPERS
CABLEWAYS	FORMS	SHOVELS
CARS	FINISHERS	TRACTORS
COMPRESSORS	GRADERS	TRUCKS
CONVEYORS	HOISTS	TRACK
CRANES	LOADERS	TANKS
CRUSHERS	LOCOMOTIVES	WAGONS
DERRICKS	MIXERS	PAVERS
DITCHERS	MOTORS	PUMPS

I have equipment located in practically every state in the Union.

ALEXANDER T. McLEOD
First Nat'l Bank Bldg., Chicago

CRUSHERS

1—No. 7½ Austin.
1—No. 5 Austin.
1—36" Symons Disc, style "B," factory guarantee.
1—24" Symons, style "C," std. factory guarantee.

CRANES

1—Browning 20 ton, 8 wheel, rebuilt.
1—Osgood No. 29, 1 cu. yd. traction.
1—O. & S. 12 ton, caterpillar, gas, 1 yd.
1—Byers, 10 ton, caterpillar, gas rebuilt.
1—O. & S. 10 ton, traction, rebuilt.

LOCOMOTIVES

2—Porter, 18 ton, 36" gauge.
2—Vulcan, 18 ton, 36" gauge.
1—Davenport, 14 ton, 36" gauge.
1—Porter, 15 ton, 36" gauge.
2—Davenport, 10 ton, 24" gauge.

SHOVELS

1—Marion Model 37, caterpillar.
1—Marion Model 36, caterpillar.
1—Northwest Model 105, gasoline, caterpillar.
1—Erie, Type B, ⅝ yd. caterpillar.

BOLL MACHINERY COMPANY
140 South Dearborn Street CHICAGO

Rare Derrick Bargain

Derrick—All steel, boom 100 ft. Capacity 15 tons, practically new. Mast and stiff legs in good condition.
Hoist—Strausburg Engine Works, Pa., three drum swinging engine included. Good condition.
Boiler—Clyde high pressure 150 lb. C. W. test; height 102 x 42; tubes in A-1 condition. Boiler new on Alexander Dam job.
Price complete $2950.00, loaded on cars, subject prior sale.

HUNTER MACHINERY COMPANY
16th St., Viaduct
MILWAUKEE, WISCONSIN

Used Equipment List

1—Stiff leg derrick, Select Oregon fir, 100 H. P. Lidgerwood hoist, 30 H. P. swinger, mast 48 ft., boom 72 feet, complete with irons, cable, buckets, etc.
1—Class 14 Bucyrus steam dragline, with 2-Yd. bucket, 60 foot boom with 15 foot extension.
1—Model 40 Marion railroad type steam shovel, Shop No. 1049.
1—Model 40 Marion railroad type steam shovel, Shop No. 2282.

GREENVILLE GRAVEL CO.
Greenville, Ohio

CRANES

1—20-ton, 8-wheel OHIO Locomotive Crane, Shop No. 3631, new 1924, A.S.M.E. & Mass. boiler, 50 ft. boom, bucket operating, M.C.B. trucks, perfect condition.
2—BROWN HOIST No. 2, full revolving Steam Crawler Cranes, new 1923, ALL STEEL CATERPILLARS, A.S.M.E. boilers, 40 ft. boom, bucket operation, like new.

CARS—LOCOMOTIVES

25—4-yd. 36" gauge, KOPPEL, two-way side dump, heavy duty, 4-pedestal, STEEL DRAFT BEAMS, new 1924, excellent condition.
2—6-ton, 36" gauge, VULCAN Gasoline Locomotives, new 1924, like new.

GREY STEEL PRODUCTS CO.
111 Broadway NEW YORK, N. Y.

FOR SALE

1—Erie Steam Shovel, type "A", ⅝ cu. yd., caterpillar traction, new in 1924. Guaranteed condition.

H. D. CONKEY & COMPANY
Mendota, Illinois

FOR SALE

1—No. 4, 6 cylinder Kritzer Hydrator, Capacity 5 tons crushed lime per hour. In good condition. Very reasonable terms. For further particulars address

MATHIESON ALKALI WORKS (Inc.)
NIAGARA FALLS, N. Y.

FOR SALE

Modern Crushing Plant

No. 5 K and No. 3 Allis-Chalmers —now operating—good quarry and location for business. Southern Iowa. Address Box 61, PIT and QUARRY, 538 S. Clark St., Chicago.

21 TON SADDLE TANK

Davenport 4 Driver Std. Ga. 11x16 cyls. 165 lb. Steam. Location Peoria, Ill. Excellent. Immediate shipment.

9-16 CU. YD. AMERICAN

Standard R. R. Ditcher. Suitable for Clam Shell Attachment.

BALLAST CARS

120 — 41 ft. 100,000 lb. cap. Rodgers-Hart Convertible Steel Underframe. First-class M. C. B. and I. C. C.

HYMAN-MICHAELS COMPANY

Peoples Gas Building

CHICAGO

ST. LOUIS NEW YORK
SAN FRANCISCO

WE BUY-- SELL--TRADE-- RENT
Construction Equipment

CRANES

1—Erie "B" 32 ft. Boom.
1—O & S 30' Boom, Trac. Wheels.
1—O & S 22-Ton, Std. Ga. 55' Boom with 1½ yd. bucket; new 1921, only used 6 months.

SHOVELS

2—Marion, Mds. 21 and 31, full Cat.
10—Bucyrus, R.B. Trucks, Caterpillar and Traction wheels, from ¾ to 4-yd. cap.
8—Marion R.B. Trucks, Caterpillar and Traction Wheels, from ¾ to 4-yd. cap.

HOISTING ENGINES

2—8¼x10 D/C D/D's with and without Boilers.
1—Mundy 8x12 3-Drum with Boiler.
9—7x10 D/D's Am. La. Ldg. Mundy.
1—Stroudsburg 8¼x10 3-Drum with Boiler.

BOILERS

1—80 H. P. Butt Strapped Locomotive Type.

LOCOMOTIVES

2—24 Ga. Plymouth Gas Power.
1—36" Ga. 8 ton Whitcomb Gas.
Also 4 Std. Ga. ranging from 20 to 50 tons

CRUSHERS

1—Gates No. 5 D.
Several Jaw Crushers.

DRAG LINES

5—Monighan Models 1-T, 2½ and 3-S.
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10—Derricks, Guy and Stiff Leg, rangeing from 5 to 30 Tons.

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1—¾-yd. type B Erie No. 1566 on Caterpillars.
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1—⅞-yd. A1 Thew on Traction Wheels.
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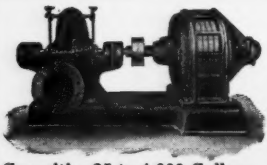

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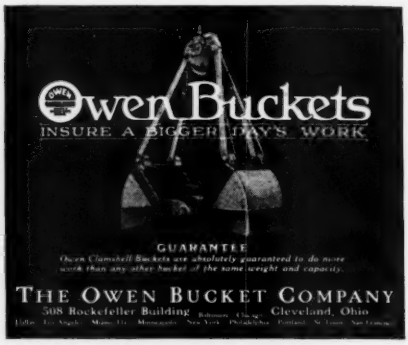
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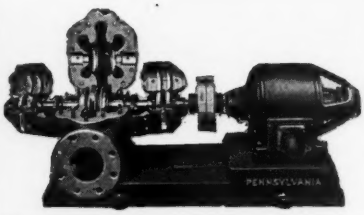

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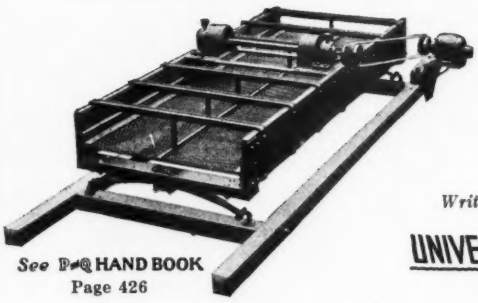

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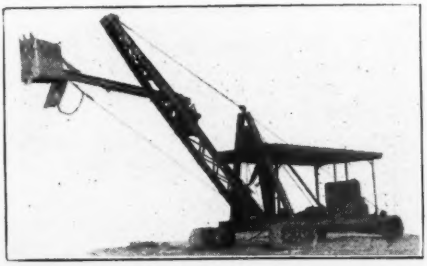

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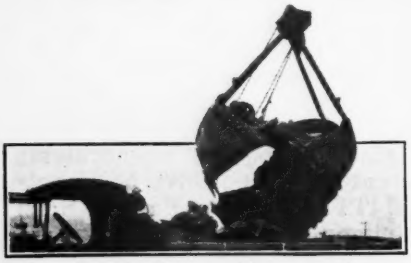

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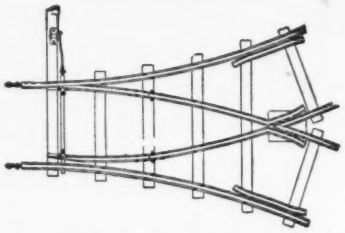

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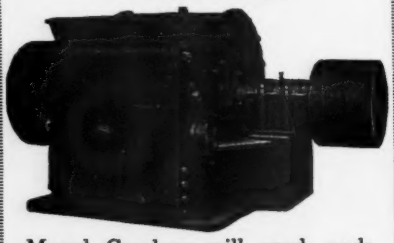

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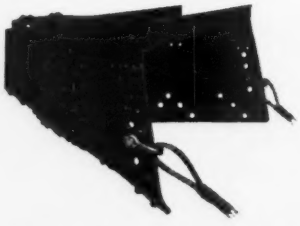

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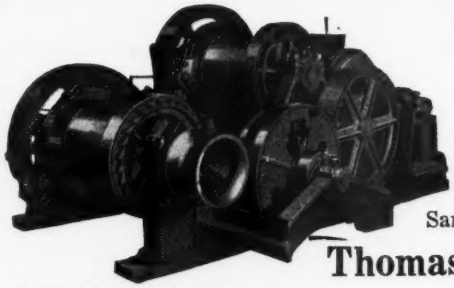

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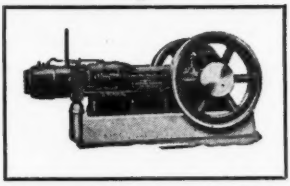

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Cost least for repairs.
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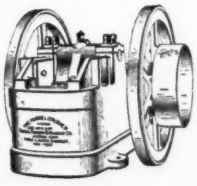

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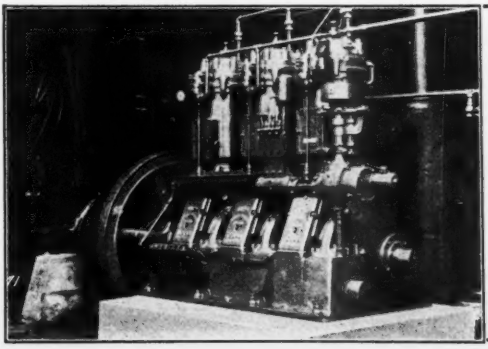

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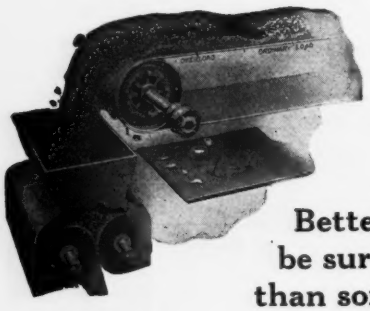
HIGH DUTY Magnetic Separators



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The ventilation feature now used increases the magnetic power 25% to 50%, providing absolute safety even with peak loads.

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An all around crusher

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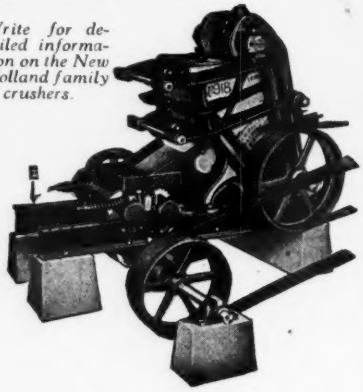

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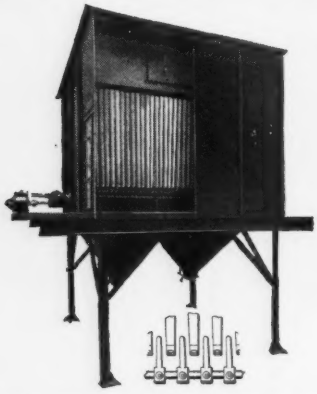

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Continuous Treads and Traction Wheels For Railroad Shovels
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It shows actual installations
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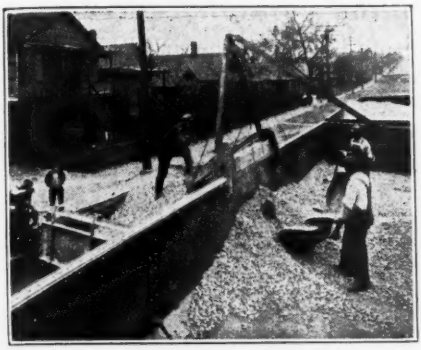

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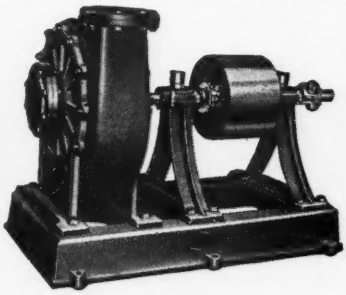

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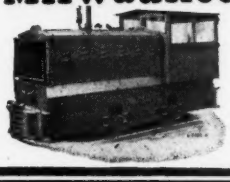

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Makers of Hammer Drills and Piston Drills

Crushing and Grinding
Material Handling
Old Equipment Modernized
Properties Examined

C. H. SONNTAG
Engineer
Cape Girardeau, Mo.

Portland Cement Plants
Electric Power Transmission
Power Plants
Waste Heat Boilers

PULVERIZERS

FOR AGRICULTURAL LIMESTONE
ASPHALT FILLER
ROCK DUST FOR MINES
THE GRIFFIN MILL—BRADLEY 3 ROLL
BRADLEY HERCULES MILLS
OUTPUTS—1-40 TONS PER HR. FINENESS—20-200 MESH.

BRADLEY PULVERIZER COMPANY
BOSTON Works: ALLENTOWN, PA. LONDON

Patents Secured to Protect Inventions

Royal E. Burnham

Patent Attorney

Continental Trust Bldg., Washington, D. C.

TRADE MARKS

SYMONS

Disc Crushers

SYMONS BROTHERS CO.

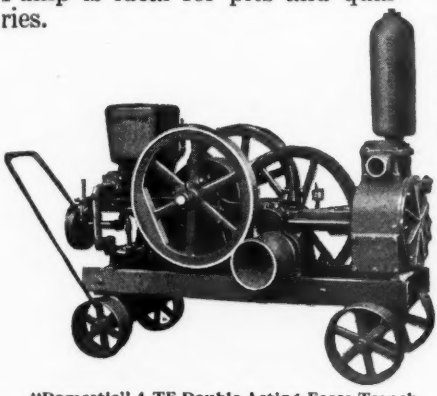
Railway Exch. Bldg., Milwaukee, Wis.
Chicago Office: 133 W. Washington St.

Los Angeles Office: 1462 Stanley Ave., Hollywood. New York Office: 120 Broadway.

DEPENDABLE "DOMESTIC" POWER UNITS

To rid your plant of water use "DOMESTIC" Dependable Pumps

Designed to handle water containing mud, silt, sludge, etc., this type of "Domestic" Force Pump is ideal for pits and quarries.



"Domestic" 4-TF Double Acting Force Trench Pump Unit

The Domestic Double Acting Force Trench Pump has large capacity and discharges through long pipe or hose line to suitable place for disposal. Furnished with either one cylinder or two cylinder gasoline engine, or can be geared for electric motor drive. Displacement capacities range from 80 to 150 gallons per minute.

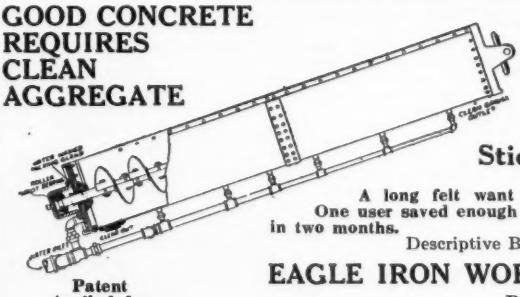
Write for Bulletin "TP"

Domestic Engine & Pump Co.

Manufacturers

SHIPPENSBURG, PENNA.

GOOD CONCRETE REQUIRES CLEAN AGGREGATE



Patent Applied for

The EAGLE WASHER

Removes Mud Balls, Sticks, Coal and Shale.

A long felt want that actually does the business. One user saved enough to pay for the cost of this washer in two months.

Descriptive Bulletin now ready.

EAGLE IRON WORKS, Des Moines, Iowa

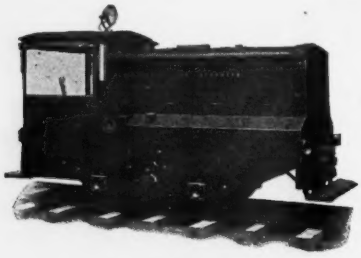
DEPT. P

The "CLIPPER"

late improved Blast Hole Drill. The "CLIPPER" predominates, has stood the test, and is approved by critics. Furnished also in the round wheel.

(Established 1842)

THE LOOMIS MACHINE CO., 15 Market St., Tiffin, Ohio



MINSTER

Draw Bar Pull

Big draw bar pull is but one of the outstanding features of Minster Locomotives. Combining the best known features designed to give highest locomotive efficiency, Minster Locomotives are capable of giving complete satisfaction from both operating and financial point of view.

Minsters are tried and proved locomotives. Their records compiled from many installations, are convincing proof of their ability. Write today for complete details and catalogue.

One of the best working haulage combinations is a Minster Locomotive and Tieco Cars. Tieco Quarry Cars are built to the same high standard as Minster Locomotives. The different types of Tieco Quarry Cars are described in our catalogue.

THE INDUSTRIAL EQUIPMENT COMPANY

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EASTERN AGENTS: K. I. CLISBY CO. WOOLWORTH BLDG., NEW YORK

WESTERN AGENTS: J. M. WILLARD CO. MARSH-STRONG BLDG., LOS ANGELES, CALIF.

EGYPTIAN IRON WORKS

MURPHYSBORO, ILLINOIS

Manufacturers of

QUARRY EQUIPMENT

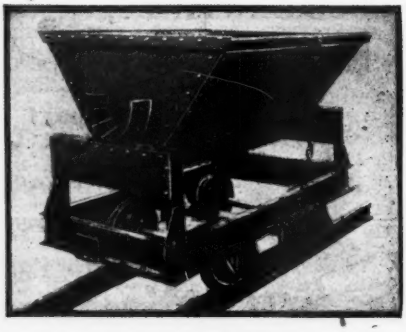
and Semi-Steel, Grey Iron Bronze and Brass Castings.

WHEELS { Quarry Car, Sheave, Traveling Crane, Channeling Machine, Drag Saw, etc.

SWITCHES—REID CAST SAFETY FROGS

Write for prices

QUALITY — SERVICE



Proved Best in Competitive Service

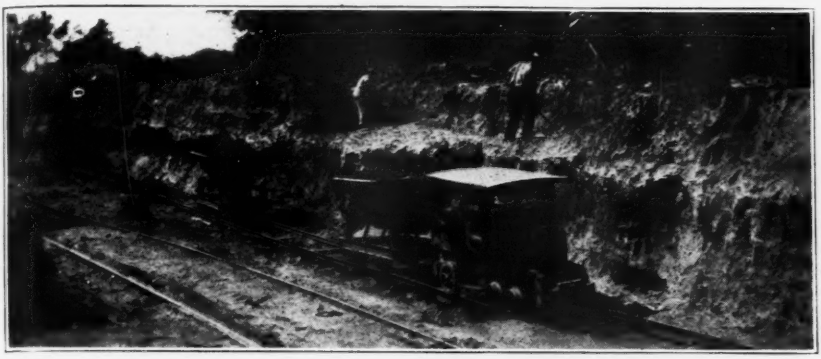
The Charles Warner Company have used different makes of dump cars and upon a basis of service they have picked Gehret Side Dump Cars as best and will now use no others.

There is a reason. Gehret Cars of one yd. capacity weigh approximately 450 lbs. more than other makes of the same capacity. And other features are in keeping—efficient and durable. Write today for details.

GEHRET BROTHERS, Inc.

Bridgeport, Montgomery County, Pa.

Manufacturers of Structural Steel and Ornamental Iron Work.



Its Record

When you "hire" such an important piece of equipment as a locomotive, its record is important; so important, we believe, that we prefer to sell Brookville Gasoline Locomotives on a basis of past performances rather than their exceptionally low cost and universal repair service.

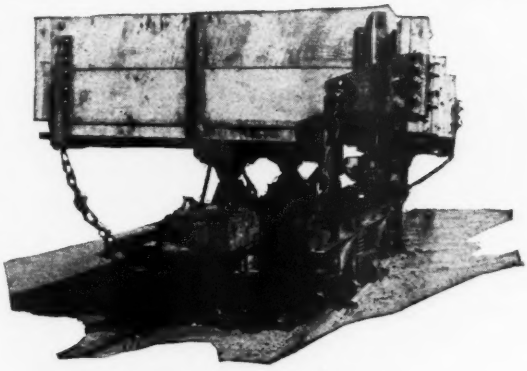
One operator says:

"We have been using our present locomotive for two years, hauling about 85 tons of material per day, doing the work of six big mules, and we believe it is one of the best investments we could have made. It certainly is doing the work for us that a $9000 locomotive in other makes would do."

Before you take any definite steps regarding the purchase of a locomotive, let us send you the "record" of Brookville Locomotives—it will show you some astonishing results in haulage economy. Write today.

BROOKVILLE TRUCK & TRACTOR COMPANY
BROOKVILLE, PA. U. S. A.

EASTON QUARRY CARS



Easton secures another patent of vital interest to all quarries.

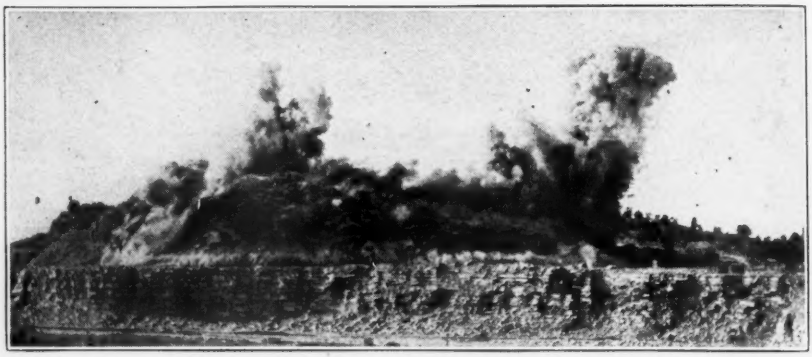
This patent covers a door operating mechanism which is so simple in its construction that it can be readily and cheaply applied to any car of either the one side or both side dumping type.

Watch for further announcement.

Easton Car & Construction Co.

Kansas City, Mo. Easton Pa.

SALES OFFICES
New York, Chicago, Pittsburgh, Philadelphia, San Francisco.



102,780 tons of shale being moved at quarry of Colorado Portland Cement Company by 17,890 pounds of explosive

Cordeau was used to detonate the explosive charges in the thirty-nine well drill holes and assisted in accomplishing these fine results.

For Safety and Efficiency, use Cordeau-Bickford, and the results obtained will satisfy you that Cordeau-Bickford is an efficient detonating agent.

The Ensign-Bickford Company

Original Manufacturers of Safety Fuse

Established 1836

SIMSBURY, CONNECTICUT

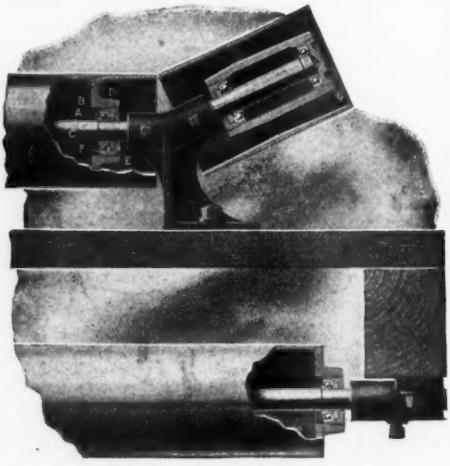
Eliminate Idler Friction with Conweigh Ball Bearing Idlers

More and more the demand in plant equipment is for intensive development and greater perfection in details. Conweigh Ball Bearing Troughing and Return Idlers represent a detail improvement which affects the whole conveying system of a plant. Because of the smooth, easy service they give, belt conveyors operate with far greater efficiency.

Conweigh Ball Bearing Idlers are smooth running, and durable, being made of hardened steel well reinforced. They give easy access for lubrication.

Get complete details on "Conweigh" Idlers. Made in all sizes. Write today.

We are the original inventors and builders of belt conveyors equipped with ball bearing idlers.



Write for detailed information

THE CONVEYING WEIGHER COMPANY

90 West Street ENGINEER & CONTRACTOR **New York**

FOR
DRAG LINES
POWER SHOVELS
DERRICKS

AMERICAN
STEEL & WIRE
COMPANY

Chicago New York

WOODHOUSE

DREDGE CHAIN

Pin Your Faith to Woodhouse Trenton

It is guaranteed strictly hand made—not partly hand made—and we use an iron made for this particular need which is scientifically and chemically selected pure pig iron, treble worked and rerolled. It withstands shocks and strains without crystallization longer than any other known iron, hence breaks less while in use.

We have satisfied the most exacting operators and engineers with this chain and have their testimonials showing that our chain wears at least 50 per cent to 100 per cent longer than other makes.

Our list of satisfied users is growing steadily. Let us send it to you.

Specify Woodhouse Chains

WOODHOUSE CHAIN WORKS
Third Street Trenton, N. J.

WOODHOUSE CHAIN WORKS,
Third St., Trenton, N. J.

Send me a copy of your testimonial pamphlet.

Name .....

Firm .....

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SALEM

Genuine

Elevator Buckets

Since 1880, when Salem Buckets were awarded First Premium for superiority, no other make of bucket has approached the Salem in quality, long wear and unusual service. It is made in many different sizes and gauges of steel ranging from 24 gauge to 6 gauge, and is adaptable for handling materials of practically any size, shape or weight.

Our ability to furnish special buckets made up in accordance with your specifications enables us to offer excellent service and prompt delivery.

Fig. 156 Perforated—for handling wet substances which require drainage during the elevating process. Perforations afford outlet for air and water in the "take" and facilitate delivery by inletting air when bucket is inverted.

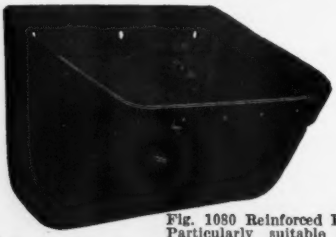


Fig. 1080 Reinforced Edge. Particularly suitable for handling abrasive or otherwise difficult material.

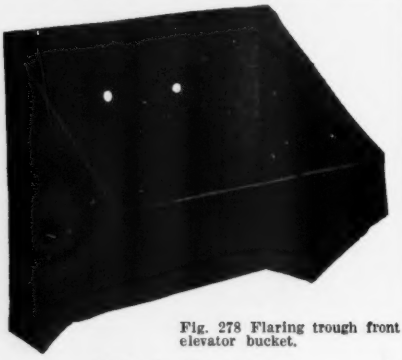


Fig. 278 Flaring trough front elevator bucket.

Write for Catalog 3625

MULLINS BODY CORPORATION

Successor to

W. J. CLARK CO.

106 Mill St., Salem, Ohio

BURCH PORTABLE CONVEYOR

Easy Loading of Sand, Gravel, Stone

A Burch All Steel Portable Conveyor will give you ease in loading and handling of materials. With a Burch you can load any bulk material from stock pile or pit, to or from wagons or bins, and jump from one job to another on short notice. The portability and easy adjustment of this loader to low or high position are outstanding advantages.

Owners of Burch All Steel Portable Conveyors speak warmly of the savings they effect. The belt runs in trough style, thus carrying more material and saving the edges.

Burch Conveyors are furnished with high grade gas or electric motor.

Catalogue and prices on request.

THE

BURCH PLOW WORKS CO.

CRESTLINE, OHIO.

BURCH PORTABLE CONVEYOR

CYCLONE NUMBER FOURTEEN BIG BLAST HOLE DRILLS

Whatever success Cyclone No. 14 Big Blast Hole Drills have attained in the quarry industry during the fifteen years of their existence has been due to close adherence to the following ideals and principles:

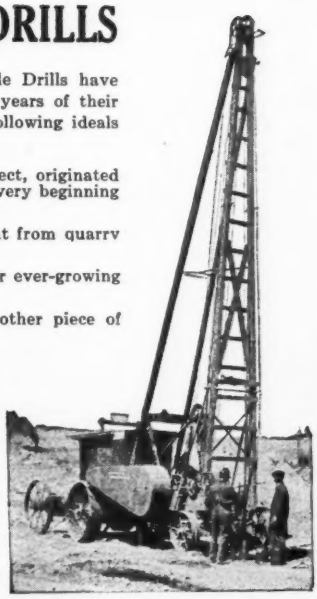
1—Starting with a design that was basically correct, originated after a close study of the requirements at the very beginning of the use of well drills in quarrying.

2—Always welcoming suggestions for improvement from quarry operators.

3—Keeping in close touch with the field and their ever-growing requirements.

4—Never holding the idea that a drill or any other piece of machinery could be perfect or faultless.

The story of the development of Cyclone No. 14 drills is completely told in our 100-page catalog B-45. It also contains 40 pages of cost and operating data on quarry drilling and blasting. Ask for a copy.



THE SANDERSON-CYCLONE DRILL CO.

Orrville, Ohio

Eastern & Export Office:
30 Church St., New York City

ELEVATORS, SCREENS
Conveyors & Equipment

WHATEVER your needs in mechanical handling and screening equipment for sand-and-gravel or quarry plant, you will profit by getting in touch with this Company. We carry an extensive stock and shop facilities for turning out your needed equipment in short order.

In thinking of a new or enlarged plant you will want our Catalog 623 for ready reference. **Ask for it.**

Manufacturers of
THE GEORGE
-Truck and- Wagon Loaders
Portable Belt Conveyors

HAISS

Established 1892
MFG. CO. INC
Clam Shell -Buckets-
Mat'l Handling Equipment

142nd St. and Rider Ave., New York, N. Y.

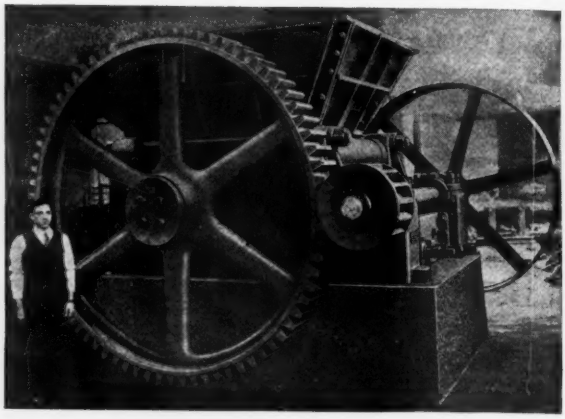
Representatives Throughout the World
Cable Address "Coalhoist" New York—"Western Union 5 Letter Edition" Code.

Built on Correct Principles

The first McLanahan Crusher, built 33 years ago, was constructed on the single roll plan, and was from the beginning very successful. Since that time, naturally, there have been many improvements and refinements.

The McLanahan Single Roll Crusher is notable for compactness and capacity. It takes wet or slimy material, and requires no apron or hand feeding. You will be interested in reading complete details, mailed on request.

McLanahan Screens, Washers, Elevators and other special machinery, are made to conform to the same high standard as our Single Roll Crushers. Write for full information.



McLANAHAN-STONE MACHINE CO.
HOLLIDAYSBURG, PA.

WOVEN WIRE SCREENS

Properly chosen screens save Power, Attendance, Investment and Replacement costs, improve your product and increase your output.

Catalogue No. 47-E is a Text-book on Screens. It's free. Get your copy from the first edition.

The LUDLOW-SAYLOR WIRE COMPANY St. Louis
610 South Newstead Avenue

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SHAPES
WIRE

TRADE ROL-MAN MARK

PLATES
SHEETS
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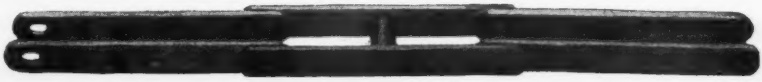
ROL-MAN FLAT LINK MANGANESE STEEL CHAINS

DREDGE, ELEVATOR, CONVEYOR, DRAG, DRAW-BENCH, TRACTOR



Of all metals Manganese Steel has the greatest resistance to wear. Rol-Man Flat Link-Chains and accessories are made of the highest grade Rolled and Forged Manganese Steel, accurate to pitch and true in size.

The longer service that you get with Rol-Man Manganese Steel Chain, Pins, Bushings, Buckets, Bucket Lips, Fan Blades, Fan Liners, etc., makes them in the end, the more economical equipment.

Diminished interruptions to operations ALONE more than pay the whole cost of "ROL-MAN" Manganese Steel Wearing Parts.

Makers of ROL-MAN Double Lock Mesh Screens, and ROL-MAN Manganese Steel Welding Rods.

MANGANESE STEEL FORGE CO.

RICHMOND ST. & ERIE AVE., PHILADELPHIA, PENNA., U. S. A.

1500 Ft. Tramway in West Virginia
Capacity 100 Tons Per Hour

EFFICIENT

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HAULAGE

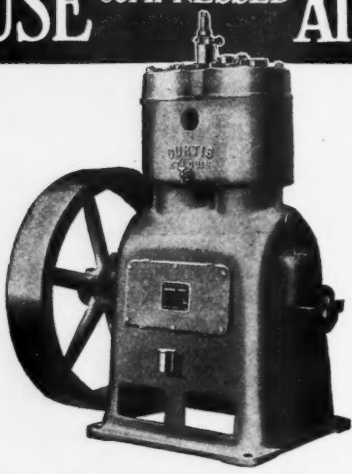
Automatic Aerial Tramway

Our Engineering Department
is Ready to Study Your Problem

INTERSTATE EQUIPMENT CORPORATION

25 Church St. New York City

USE *COMPRESSED* AIR



Use Curtis Compressors

For all drilling and other quarry operations requiring pneumatic tools —use compressed air supplied by a Curtis Model "A". Fully enclosed Controlled Splash Oiling Compressor.

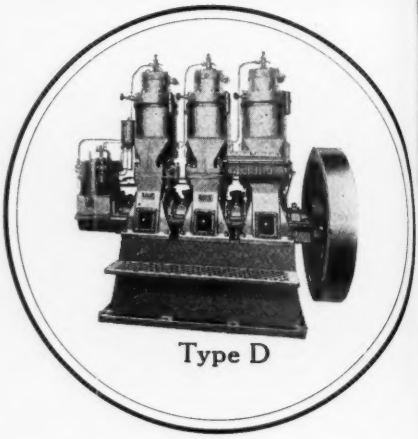
Curtis Model "A" Air Compressors are the result of over 28 years spent in the design and manufacture of air compressors known everywhere for their advanced engineering features, extreme durability and all-round mechanical excellence. They are full self-oiling through means of a controlled splash regulatable sight feed lubrication system. Heads, valves and cylinder walls are water cooled and present a greater cooling surface than in double-acting compressors of equal capacity. This feature increases volumetric efficiency. Fully enclosed—dust and dirt proof. Built in various sizes and capacities up to 250 lb. displacement.

Write for further details—
Ask for Bulletin C-3

CURTIS PNEUMATIC MACHINERY CO.
1628 Kienlen Ave. St. Louis, Mo.
Branch Office: 531-K Hudson Terminal, New York

CURTIS AIR COMPRESSORS

VENN-SEVERIN OIL ENGINE



Type D

Economy not the only reason

TYPE "D" Venn-Severin Oil Engines do lower power costs, but this isn't the only reason that operators have for preferring them.

For instance, one operator wanted, in addition to an economical engine, one that would meet exacting power requirements of constant speed under varying loads. In a Venn-Severin Oil Engine he found an economical, dependable power unit that met his requirements in a most satisfactory manner. He says:

"We are highly pleased with this engine, and to prospective buyers of same we offer our experience to date as our recommendations."

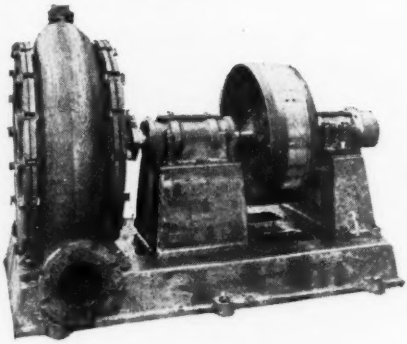
You, too, will find a Venn-Severin Type D Oil Engine will meet any power requirements in pit, quarry or plant. Let us send you complete information showing the unique features that make the Venn-Severin a better power unit.

Especially adapted to Dragline work.
Sizes range from 15 to 250 H. P.

VENN-SEVERIN MACHINE CO.
1317 West North Ave.
CHICAGO

THE ECONOMICAL POWER UNIT

PMC Manganese Steel Castings



Complete line of
Manganese Steel Castings
at Reasonable Prices

A Good Pump
and the reason

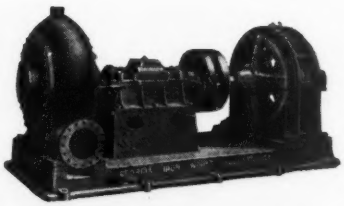
The Diamond Pump is made of manganese steel, the toughest known metal, and is durable and strong. It is designed according to principles that long experience in building pumps has proven to be best.

Diamond Pumps are built in all sizes, belt driven or direct connected motor driven.

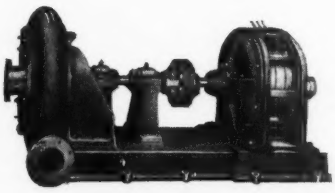
Send pump inquiries to:

W. H. K. BENNETT CO.
20 E. Jackson Blvd. Chicago, Ill.

PETTIBONE MULLIKEN CO.
Chicago, Ill.



Heavy duty directly connected motor driven sand and dredging pump. Built in 8", 10", and 12" sizes.



Overhanging type sand and dredging pump on extended base directly connected to motor.

SAND PUMPS

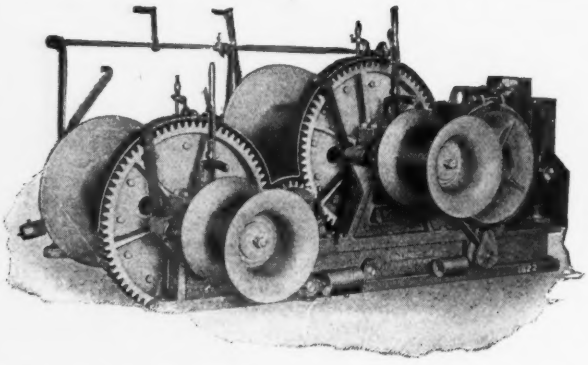
The accompanying cuts show two very popular types of directly connected motor driven units. These pumps are also built for belt drive.

Send for illustrated catalog showing our complete line of this equipment including flanged fittings and hydraulic guns.

GEORGIA IRON WORKS
AUGUSTA, GA.

LIDGERWOOD HOISTS

Steam — Electric — Gasoline



Tell us what you wish in the hoist line.

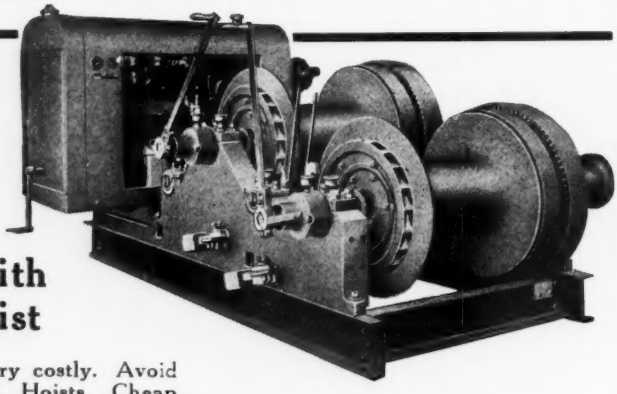
We build types to meet every need in hoisting service.

Send for Catalogs.

Our Engineers will consult with you at any time.

LIDGERWOOD MFG. CO., 96 Liberty St., New York

Chicago; Pittsburgh; Philadelphia; Detroit; Los Angeles; Seattle; Tacoma; Portland, Ore.; Brown-Marx Bldg., Birmingham, Ala. **Sales Agents:** Norman B. Livermore, San Francisco; Woodward, Wight & Co., New Orleans, La.; John D. Westbrook, Inc., Norfolk, Va.; Canadian Allis-Chalmers, Ltd., Toronto. **Foreign Offices:** Sao Paulo, Brazil; Rio de Janeiro, Brazil; London, Eng.



Your Hoisting Problems Disappear with an O. K. Hoist

Breakdowns are very costly. Avoid them by using O. K. Hoists. Cheap hoists always have a habit of falling down on the job just at a time when minutes are worth money. O. K. Hoists are the most economical because of their ability to stand the gaff and give 100 per cent results—due to scientific design and honest construction.

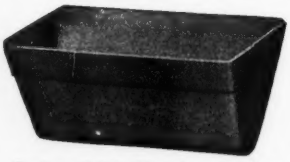
All O. K. Hoists are sturdy, comparatively light in weight and easily removed from place to place. No experts are required for operating, and any garage is able to repair and adjust O. K. Hoists. Send for full information.

O. K. CLUTCH & MACHINERY CO.

BOX 305, COLUMBIA, PA.

Howe Chains, Wheels and Buckets For Every Service

Sprocket Wheel for Drive Chain



Style "AA" Elevator Bucket

THE design and manufacture of Howe Standard and Special Chains, Wheels and Buckets, are based squarely upon the particular service which these products must perform in actual use.

The performance records of Howe products testify to our unusual success in meeting the requirements of users in every industry.

Howe Chain Company facilities are thoroughly modern in every respect, approved methods of manufacture are employed throughout, and every process is under constant and careful supervision and inspection by experienced and capable engineers.

For Chains, Wheels and Buckets that give efficient and long-lived service, specify HOWE. Catalog, prices, and full particulars on request.

Howe Products

Howe Malleable Detachable Chains and Attachments. Closed End Pintle Chains, Malleable Iron and Steel Combination Chain, Heavy Closed End Pintle Chain, Ley Bushed Chain, Malleable Iron Roller Chain, Steel Bushed Roller Chain, Steel Strap Chain, Drop Forged Steel Chain, Malleable. Iron Elevator Buckets, Sprockets and Traction Wheels.

HOWE CHAIN COMPANY, MUSKEGON, MICH.

CHAIN SPECIALISTS

HOWE CHAIN

Keep Your Equipment in Good Working Condition

MAINTAIN a constant low-cost production. Renew worn gears, chains, sprockets, bearings or other parts of your elevators, conveyors or power transmission.

Inspect your equipment at regular intervals, and make the necessary replacements. That's the basis of modern production.

No matter what your needs in elevating, conveying and power transmission machinery there is a Caldwell product to supply the want. Address Caldwell, or nearest Link-Belt office.

H. W. CALDWELL & SON CO.
LINK-BELT COMPANY, OWNER
Chicago, 1700 S. Western Ave.
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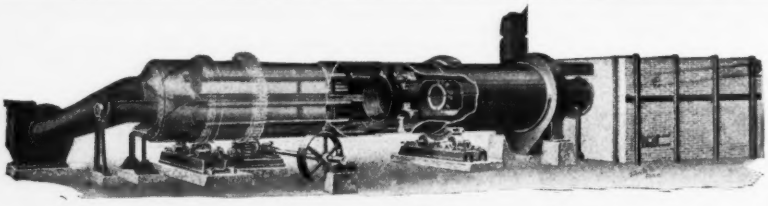

Buckeye Type B Dryer

Efficient—Economical to Operate—Lowest Fuel Costs

Material is dried thoroughly and uniformly.
White materials dried without discoloration.
Our Engineering Department will solve your drying problems.
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THE BUCKEYE DRYER CO.
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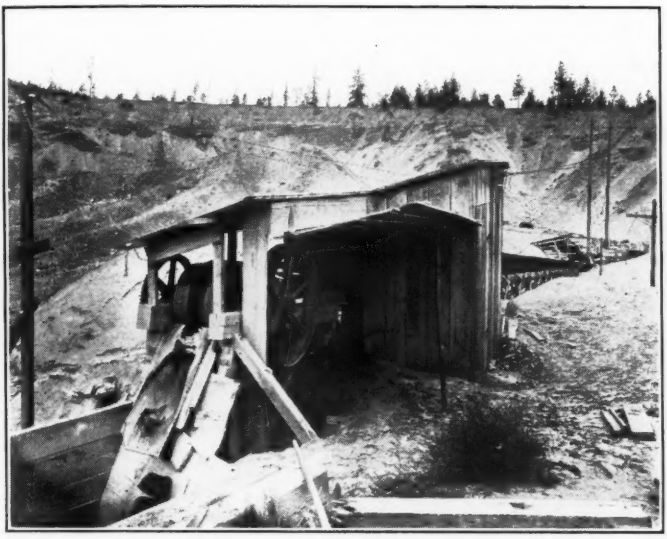


This is severe service for a conveyor belt

Don't forget that fact when purchasing belts for use on conveyors in the sand pits.

As conveying work goes, carrying a load of sand and gravel, with its millions of small sharp particles, is severe beyond the average. The typical conveyor shown in the photograph above carries 150 tons per hour of such particles. It doesn't pay to skimp on belt quality for such work. The constant abrasion soon tells on a belt which does not have a tough enough cover.

"U. S." Giant Conveyor Belt is built for just such severe conditions. It has a rubber cover of the toughest stock made, and will more than prove its value by its extra length of life.

Whether it be conveyor, elevator or transmission belting, you should investigate "U. S." belts before deciding that something else will do well enough.

Trade Mark

United States Rubber Company

1790 Broadway, New York City

Branches in every industrial center

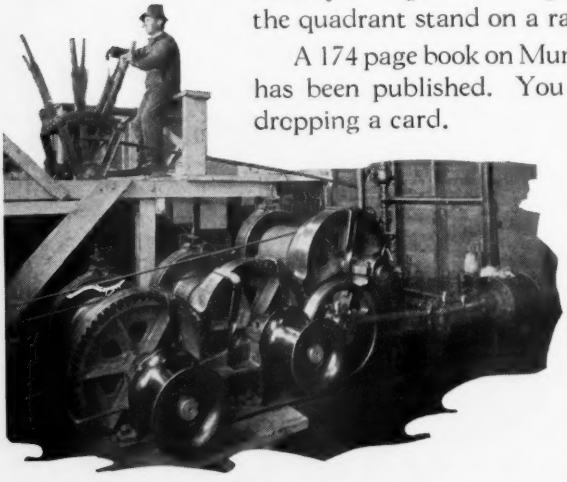
500 Yards of Sand in 7 Hours

A Mundy Steam Hoist is unloading 70 yards of sand and gravel an hour at the plant of the Studwell Mason Supply Co., at Port Chester, New York. The hoist readily raises the 1½ yard clamshell bucket with two yards of mixture, making a total load of 10,000 lbs.

TRADE MARK MUNDY ESTABLISHED 1869

The stiff leg derrick is operated by a 10½"x10" three drum hoisting engine with an independent Mundy Swinger. This rig is entirely controlled by the quadrant stand on a raised platform.

A 174 page book on Mundy Hoisting Equipment has been published. You can get your copy by dropping a card.



J. S. Mundy Hoisting Engine Co.

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Agents in Principal Cities

MUNDY HOISTS